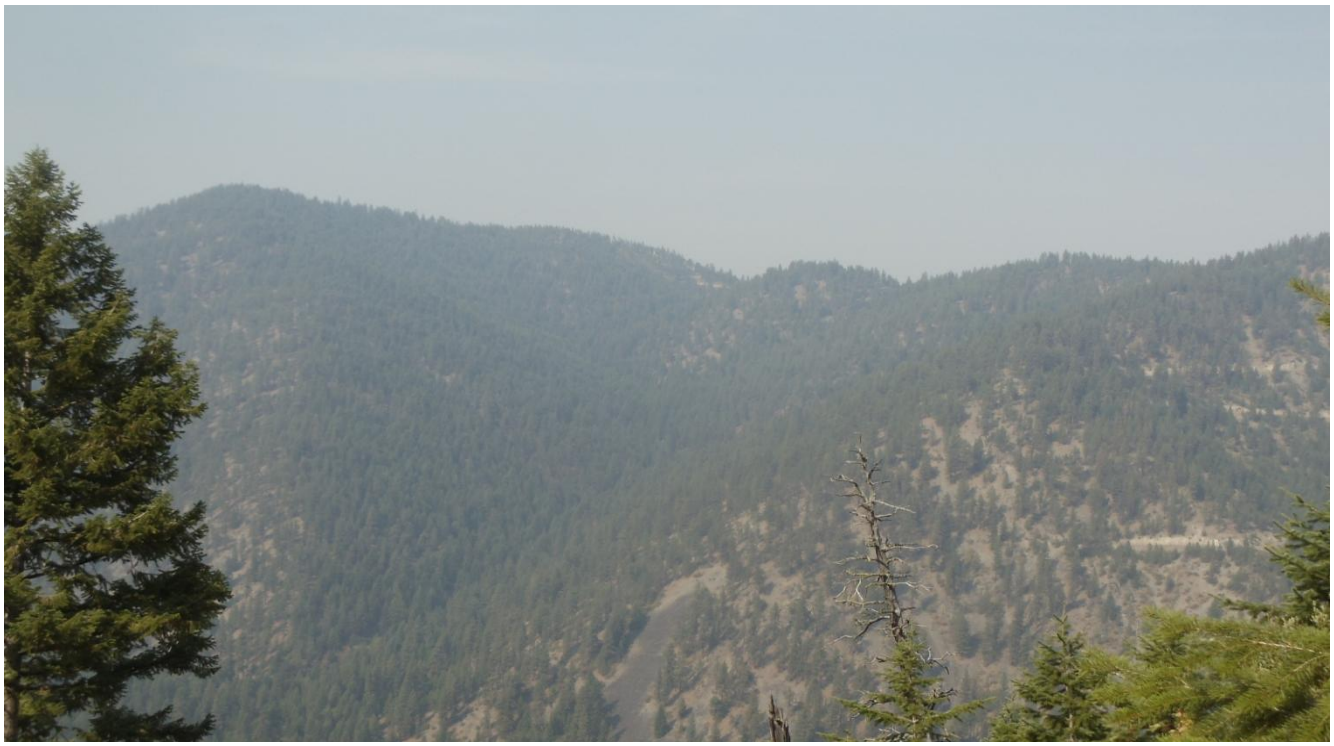
Rivulet Peak Timber Sale
Checklist Environmental Assessment



February 27, 2014
Montana Department of Natural Resources and Conservation
Southwestern Land Office
Missoula Unit

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CHECKLIST ENVIRONMENTAL ASSESSMENT

Project Name: Rivulet Peak Timber Sale
Proposed Implementation Date: July 2014
Proponent: Department of Natural Resources and Conservation – Missoula Unit
Location: Sections 10 and 14 T14N R25W
County: Mineral

I. TYPE AND PURPOSE OF ACTION

The Missoula Unit of the Montana Department of Natural Resources and Conservation (DNRC) is proposing to harvest approximately 1 million board feet (MMBF) of saw timber near Fish Creek in the lower Clark Fork River drainage. The proposed project area is composed of 1,152 acres of Public Building trust land located approximately 16 miles southeast of Superior, MT.

Objectives include:

- Generating revenue for the Public Building trust,
- Reducing the incidence of dwarf mistletoe in western larch,
- Recovering the value of dead and dying lodgepole pine and
- Promoting natural regeneration of seral species.

This Environmental Assessment includes analysis of Temporary Road Use Permits (TRUP's) across Montana Fish, Wildlife and Parks (FWP) Fish Creek Wildlife Management Area (WMA) and Fish Creek State Park lands on approximately 7 miles of existing roads. Also included is the acquisition of a permanent non- cost share easement from the Lolo National Forest on approximately 375 feetof existing road. Lastly the EA analyzes the construction of approximately 2.3 miles of new road to provide access to proposed harvest units.

The lands involved in the proposed project are held in trust by the State of Montana for the support of specific beneficiary institutions. These include public schools, state colleges and universities, and other specific state institutions such as the School for the Deaf and Blind (Enabling Act, February 22, 1889; 1972 Montana Constitution, Article X, Section 11). The Board of Land Commissioners (Land Board) and the DNRC are required by law to administer these Trust Lands to produce the largest measure of reasonable and legitimate long term advantage for the beneficiary institutions (Section 77-1-202, MCA). All forested lands involved in the proposed project would be managed in accordance with DNRC's State Forest Land Management Plan (SFLMP), the Montana DNRC Forested State Trust Land Habitat Conservation Plan (HCP), Administrative Rules for Forest Management (ARMs: ARM 36.11.401 – 456) and other applicable state and federal law.

II. PROJECT DEVELOPMENT

1. PUBLIC INVOLVEMENT, AGENCIES, GROUPS OR INDIVIDUALS CONTACTED:
Provide a brief chronology of the scoping and ongoing involvement for this project. List number of individuals contacted, number of responses received, and newspapers in which notices were placed and for how long. Briefly summarize issues received from the public.

The proposed project was introduced to FWP in January, 2011 in the course of developing other unrelated projects. Scoping was initiated in June, 2011 with public notices mailed or emailed to 28 interested parties, adjacent property owners and the Mineral County Commissioners. Notices were also submitted to FWP and DNRC resource specialists. A public notice was posted in *The Mineral Independent* and *The Missoulian* for 10

days in June, 2011. In September, 2012, a DNRC Interdisciplinary Team (IDT) began project area analysis and internal review to develop a project plan.

The DNRC received comments from the Mineral County Road Department, Mineral County Commissioners, FWP and the Confederated Salish and Kootenai Tribes (CSKT) in addition to issues identified by DNRC specialists. Comments received were all in favor of proposed activities and included comments and concerns about harvesting, roads, wildlife, and weed treatment. All of which are considered and in line with our State Forest Land Management Plans.

The DNRC approached FWP Fish Creek WMA managers in December, 2012 to request access to trust lands involved in the timber sale. On January 10, 2013 DNRC and FWP WMA staff conducted a field tour of proposed harvest units and new roads. The DNRC initiated a TRUP request with FWP Fish Creek State Park managers and conducted a field tour on May 7, 2013. In the summer and fall of 2013, DNRC conducted a series of meetings with WMA managers to finalize project mitigations and TRUP requirements. The TRUP will be approved upon review and agreement of the Rivulet Peak EA from both the Parks and Wildlife divisions from FWP in February or March 2014.

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2. OTHER GOVERNMENTAL AGENCIES WITH JURISDICTION, LIST OF PERMITS NEEDED:
Examples: cost-share agreement with U.S. Forest Service, 124 Permit, 3A Authorization, Air Quality Major Open Burning Permit.

Cost Share discussions with the Lolo National Forest have been initiated on Forest Service roads providing access to the project area.

The DNRC has requested temporary road use permits from FWP to access proposed harvest units across Fish Creek State Park and Fish Creek WMA lands.

Culvert installation on a class 3 stream in Section 10 T14N R25W would require 124 Permit approval from FWP.

DNRC is classified as a major open burner by the Montana Department of Environmental Quality (DEQ), and is issued a permit from the DEQ to conduct burning activities on State lands managed by the DNRC. As a major open burning permit holder, DNRC agrees to comply with all of the limitations and conditions of the permit.

DNRC is a member of the Montana/Idaho Airshed Group, which regulates prescribed burning, including both slash and broadcast burning, related to forest management activities done by DNRC. As a member of the Airshed Group, DNRC agrees to burn only on days approved for good smoke dispersion as determined by the Smoke Management Unit in Missoula, MT.

In December 2011, the Land Board approved the Record of Decision (ROD) for the Montana Forested State Trust Lands HCP. Approval of the ROD was followed by the issuance of an Incidental Take Permit (Permit) by the U.S. Fish and Wildlife Service (USFWS). The HCP is a required component of an application for a Permit which may be issued by the U.S. Fish and Wildlife Service or National Marine Fisheries Service to state agencies or private citizens in situations where otherwise lawful activities might result in the incidental take of federally-listed species. The HCP is the plan under which DNRC intends to conduct forest management activities on select forested state trust lands while implementing specific mitigation requirements for managing the habitats of grizzly bear, Canada lynx, and three fish species: bull trout, westslope cutthroat trout, and Columbia redband trout on project area lands covered under the HCP where these species may be affected.

The proposed action is limited to specific management activities that are needed to implement the project and provide resource protection. This Environmental Assessment (EA) documents site-specific analysis and is not a general management plan or programmatic analysis of the area. The scope of this EA was determined through DNRC interdisciplinary analysis and public involvement.

3. ALTERNATIVE DEVELOPMENT:
Describe alternatives considered and, if applicable, provide brief description of how the alternatives were developed. List alternatives that were considered but eliminated from further analysis and why.

Alternative A: Deferred Harvest (No Action)

Harvest would not occur in the project area at this time. No revenue would be generated in support of the Public Building trust as a result of the proposed action. DNRC approved activities would continue in the project area as Missoula Unit priorities and funding allow.

Alternative B: Harvest (Action)

Alternative B: Harvest (Action) was developed to address issues identified through public comment and IDT analysis, comply with applicable regulations and laws, provide effective mitigation for potential impacts and achieve project objectives. The proposed harvest would include removal of approximately 1 MMBF of Douglas-fir, western larch, lodgepole pine and ponderosa pine sawlogs and 200 tons of pulp/biomass material from approximately 146 acres of school trust lands through a combination of Sanitation (SAN), Salvage (SAL), Shelterwood (SW) and Commercial Thinning (CT) prescriptions (Attachment B, Table 4). Stands were identified for treatment based on field reconnaissance by the project IDT. Maps of the project location, transportation plan and proposed treatment can be found in Attachment A: Project Maps.
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Silvicultural prescriptions were developed to emulate natural disturbance processes as required by the Montana Administrative Rules for Forest Management (ARM 36.11.408). Specific information about proposed harvest prescriptions can be found in Attachment B: Resource Analysis.

The project would include approximately 2.3 miles of new road construction to access proposed harvest units. .17 miles (919 feet) of new construction would be located on Fish Creek WMA lands, 0.1 miles (68 feet) would be located on Fish Creek State Park lands, and 2.18 miles (11,532 feet) would be located on Trust Lands. New roads constructed on Fish Creek WMA lands would be decommissioned upon project completion.

III. IMPACTS ON THE PHYSICAL ENVIRONMENT

- *RESOURCES potentially impacted are listed on the form, followed by common issues that would be considered.*
- *Explain POTENTIAL IMPACTS AND MITIGATIONS following each resource heading.*
- *Enter "NONE" If no impacts are identified or the resource is not present.*

4. GEOLOGY AND SOIL QUALITY, STABILITY AND MOISTURE:
Consider the presence of fragile, compactable or unstable soils. Identify unusual geologic features. Specify any special reclamation considerations. Identify direct, indirect, and cumulative effects to soils.

Forest management activities have the potential to increase erosion and reduce soil productivity where excessive disturbance from compaction, displacement, or loss of nutrients occurs. Implementation of Forest Management Best Management Practices (BMP'S), recommended mitigations and operating season limitations would likely result in low to moderate risk of direct or indirect effects to geology and soil resources and low risk of cumulative effects to geology or soil resources associated with the proposed action.
A detailed soil resource analysis can be found in Attachment B: Resource Analysis-Soils.

5. WATER QUALITY, QUANTITY AND DISTRIBUTION:

Identify important surface or groundwater resources. Consider the potential for violation of ambient water quality standards, drinking water maximum contaminant levels, or degradation of water quality. Identify direct, indirect, and cumulative effects to water resources.

The proposed action could impact water resources through sediment delivery to streams and changes to vegetation that may increase the water yield from proposed harvest units. Implementation of BMP's, recommended mitigation measures and operating season limitations would result in low risk of direct, indirect or cumulative effects from sedimentation or water yield increases.

A detailed water resources analysis and mitigations can be found in Attachment B: Resource Analysis-Water Quality

6. AIR QUALITY:

What pollutants or particulate would be produced (i.e. particulate matter from road use or harvesting, slash pile burning, prescribed burning, etc)? Identify the Airshed and Impact Zone (if any) according to the Montana/Idaho Airshed Group. Identify direct, indirect, and cumulative effects to air quality.

Alternative A: Deferred Harvest

No changes to air quality would occur and no pollutants or particulate would be produced under the No Action alternative. No prescribed burning of logging slash would occur as a result of the proposed project.

Alternative B: Harvest

The DNRC is a member of the Montana/Idaho Airshed Group which was formed to minimize or prevent smoke impacts while using fire to accomplish land management objectives and/or fuel hazard reduction (Montana/Idaho Airshed Group 2006). The Group determines the delineation of airsheds and impact zones throughout Idaho and Montana. Airsheds describe those geographical areas that have similar atmospheric conditions, while impact zones describe any area in Montana or Idaho that the Group deems smoke sensitive and/or having an existing air quality problem (Montana/Idaho Airshed Group 2006). The proposed project is in Airshed 3a.

Direct , Indirect, and Cumulative Effects of the No-Action Alternative on Air Quality: Under the No Action Alternative slash piles would not be created or burned. Thus, there would be no effects to air quality within the local vicinity and throughout Airshed 3b.

Direct , Indirect, and Cumulative Effects of the Action Alternative on Air Quality: Under the Action Alternative, slash piles consisting of tree limbs and tops and other vegetative debris would be created throughout the project area during harvesting. These slash piles would ultimately be burned after harvesting operations have been completed. Burning would introduce particulate matter into the local airshed, temporarily affecting local air quality. Over 70% of emissions emitted from prescribed burning is less than 2.5 microns (National Ambient Air Quality PM 2.5). High, short-term levels of PM 2.5 may be hazardous. Within the typical column of biomass burning, the chemical toxics are: Formaldehyde, Acrolein, Acetaldehyde, 1,4 Butadiene, and Polycyclic Organic Matter.

Burning within the project area would be short in duration and would be conducted when conditions favored good to excellent ventilation and smoke dispersion as determined by the Montana Department of Environmental Quality and the Montana/Idaho Airshed Group. The DNRC, as a member of the Montana/Idaho Airshed Group, would burn only on approved days. Thus, direct and indirect effects to air quality due to slash pile burning associated with the proposed action would be minimal.

Burning that may occur on adjacent properties in combination with the proposed action could potentially increase cumulative effects to the local airshed and the Class I Areas. The United States Forest Service and large scale industrial forestry operations in the area participate as airshed cooperators and operate under the same Airshed Group guidelines as the DNRC. Non-industrial timberland operators are regulated by the Montana

Department of Environmental Quality and burning is only allowed during seasons that provide good ventilation and smoke dispersion. Thus, cumulative effects to air quality due to slash pile burning associated with the proposed action would also be expected to be minimal.

Harvesting equipment and log hauling may create dust that could impact air quality. Dust control and road surfacing may be required as a contract stipulation. Due to prevalent wind directions and the distance of proposed landing locations and haul roads from adjacent residences and Interstate 90, there is low risk of direct, indirect or cumulative effects to air quality.

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7. VEGETATION COVER, QUANTITY AND QUALITY:

What changes would the action cause to vegetative communities? Consider rare plants or cover types that would be affected. Identify direct, indirect, and cumulative effects to vegetation.

The proposed action would reduce canopy cover and stocking of mature trees, resulting in a more developed understory. Grass and forbs would likely increase and regeneration of ponderosa pine, western larch and Douglas-fir would likely occur where harvest created canopy gaps.

Large vigorous ponderosa pine, Douglas-fir and western larch free of dwarf mistletoe infection would be retained on a 40 foot average spacing as growing stock and seed source. Leave trees are typically evenly distributed but may be clumped. Large emergent ponderosa pine, western larch and Douglas-fir are present in clumps throughout proposed harvest units. Most of these trees would be retained as wildlife trees and snag recruits. No rare plants were identified in the project area. A detailed analysis of Vegetation Cover, Quantity and Quality can be found in Attachment B: Resource Analysis.

A detailed vegetation analysis can be found in Attachment B: Resource Analysis-Vegetation

There is potential for the introduction and spread of noxious weeds due to soil disturbance associated with timber harvest and road maintenance. An integrated weed management approach including prevention, revegetation, monitoring and treatment would reduce the possibility of noxious weed infestation. Contract stipulations would include washing of all machinery and inspection by the DNRC prior to delivery to the project area. Revegetation of disturbed sites would encourage desirable species. Monitoring for noxious weeds and herbicide treatment during and after project completion would address new infestations.

A detailed noxious weed management analysis can be found in Attachment B: Resource Analysis-Noxious Weeds

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8. TERRESTRIAL, AVIAN AND AQUATIC LIFE AND HABITATS:

Consider substantial habitat values and use of the area by wildlife, birds or fish. Identify direct, indirect, and cumulative effects to fish and wildlife.

The project area has been identified as providing forested habitat connectivity and facilitating wildlife movement. Proposed harvest units and prescriptions would minimize effects to terrestrial and aquatic wildlife and habitat. Appropriate mitigation measures would be implemented as recommended by the DNRC wildlife biologist, fisheries biologist and FWP. The project would comply with the Montana Administrative Rules for Forest Management and the Montana DNRC Forested Trust Lands Habitat Conservation Plan as well as all other applicable rules and regulations. The proposed action would affect habitat, habitat connectivity and wildlife movement.Proposed harvesting would open up the canopy in some of these stands which would benefit wildlife species that prefer forested habitats with a more open canopy.

A detailed analysis, including issue descriptions and coarse filter effects analysis can be found in Attachment B- Fisheries Resource Analysis & Wildlife Resource Analysis

9. UNIQUE, ENDANGERED, FRAGILE OR LIMITED ENVIRONMENTAL RESOURCES:

Consider any federally listed threatened or endangered species or habitat identified in the project area. Determine effects to wetlands. Consider Sensitive Species or Species of special concern. Identify direct, indirect, and cumulative effects to these species and their habitat.

DNRC is managing the habitats of threatened and endangered species on this project by implementing the Montana DNRC Forested Trust Lands Habitat Conservation Plan (HCP) and the associated Incidental Take Permit (Permit) that was issued by the United States Fish & Wildlife Service (USFWS) in February of 2012 under Section 10 of the Endangered Species Act. The HCP identifies specific conservation strategies for managing the habitats of grizzly bear, Canada lynx, and three fish species: bull trout, westslope cutthroat trout, and Columbia redband trout. This project complies with the HCP. The HCP can be found at www.dnrc.mt.gov/HCP."

Habitat for threatened, endangered and sensitive species is present in the project area. Negligible to minor effects to Canada lynx, bald eagle, fisher, flammulated owl, gray wolf, pileated woodpecker and wolverine, would be anticipated. Mitigation measures would be implemented as recommended by the DNRC wildlife biologist, fisheries biologist and FWP.

A detailed analysis, including issue descriptions and coarse filter effects analysis can be found in Attachment B- Fisheries Resource Analysis & Wildlife Resource Analysis

10. HISTORICAL AND ARCHAEOLOGICAL SITES:

Identify and determine direct, indirect, and cumulative effects to historical, archaeological or paleontological resources.

Mine tailings and decomposed timber structures are evident on the north side of Rock Creek and Forest Service road #7764 in the south half of Section 10 T14N R25W. This site is well away from any proposed harvest unit or potential source of disturbance associated with the project.

Scoping letters were sent to those Montana Tribal entities that requested to be notified of DNRC timber sales. No response was returned that identified a specific cultural resource issue. A Class I (literature review) level review was conducted by the DNRC staff archaeologist for the area of potential effect (APE). This entailed inspection of project maps, DNRC's sites/site leads database, land use records, General Land Office Survey Plats, and control cards. The Class I search results revealed that no cultural or paleontological resources have been identified in the APE, but it should be noted that Class III level inventory work has not been conducted there to date.

Because the topographic setting and geology suggest a low to moderate likelihood of the presence of cultural or paleontologic resources, proposed timber harvest activities are expected to have *No Effect* to *Antiquities*. No additional archaeological investigative work will be conducted in response to this proposed development. However, if previously unknown cultural or paleontological materials are identified during project related activities, all work will cease until a professional assessment of such resources can be made.

11. AESTHETICS:

Determine if the project is located on a prominent topographic feature, or may be visible from populated or scenic areas. What level of noise, light or visual change would be produced? Identify direct, indirect, and cumulative effects to aesthetics.

The project area is adjacent to the Fish Creek State Park and Fish Creek WMA. Motorized and non-motorized recreation occurs on FWP lands and on trust lands in the project area. Proposed harvest unit 2 is visible from Interstate 90 and the Alberton Gorge portion of the Clark Fork River.

Alternative A: Deferred Harvest (No Action)

No changes to current conditions would be expected under the No Action alternative.

Alternative B: Harvest (Action)

Timber harvest and new road construction could change the current viewshed in the project area. Machinery and log hauling would temporarily produce moderate levels of unnatural noise during periods of operation. Approximately 2.35 miles of new roads would be built to access harvest units, which can appear unnatural in forested mountain landscapes.

The project would reduce stand densities by 40-60% in harvest units. Silvicultural prescriptions would retain large healthy trees on a 40 foot average spacing within harvest units, including the majority of larger emergent trees that are generally considered visually appealing. The presence of skid trails, logging slash, stumps, yarding corridors and the uniform spacing of leave trees could impact aesthetics in harvest units.

In comparison to adjacent lands where past management removed most of the canopy or the entire canopy, harvest units would generally retain a forested appearance. Shelterwood and commercial thinning prescriptions typically retain enough large tree crowns to obscure 40-80% of road segments above cable harvest units depending on the point of observation. Revegetation of disturbed soils as a weed management practice would also reduce the visibility of roads. As a result, the proposed action is expected to have minor direct, indirect and cumulative effects to aesthetics.

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12. DEMANDS ON ENVIRONMENTAL RESOURCES OF LAND, WATER, AIR OR ENERGY:

Determine the amount of limited resources the project would require. Identify other activities nearby that the project would affect. Identify direct, indirect, and cumulative effects to environmental resources.

The proposed action is not expected to require any limited resources. No direct, indirect or cumulative effects to environmental resources would be expected.

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13. OTHER ENVIRONMENTAL DOCUMENTS PERTINENT TO THE AREA:

List other studies, plans or projects on this tract. Determine cumulative impacts likely to occur as a result of current private, state or federal actions in the analysis area, and from future proposed state actions in the analysis area that are under MEPA review (scoped) or permitting review by any state agency.

Montana FWP recently acquired 40,176 acres of forest land previously owned by Plum Creek Timber Company in the Fish Creek vicinity immediately south of the project area and the Nemote Creek/Cyr vicinity north and east of the project area. This land is currently managed as a 34,573 acre Wildlife Management Area and 5,603 acre State Park. There is an increased emphasis on fish and wildlife resources, habitat quality and recreation opportunities in the project area as a result of this land acquisition. This acquisition was analyzed under the Fish Creek Acquisition Environmental Assessment in January, 2010.

Montana Fish, Wildlife & Parks has released a draft EA describing potential trail and camping facility development in Fish Creek State Park over a 10-year period.

Other DNRC projects recently completed, in progress or in development in proximity to the proposed Rivulet Peak Timber Sale are listed below.

Project Name	Approximate Air Miles from Project Area	Year of Activity	Status	Description of Activity
Timber Creek Timber Sale	44	2007	Completed	Timber Harvest
Roman Thinning II	23	2009	Completed	Precommercial Thinning
Tarkio Timber	2	2011	In Progress	Timber Harvest

Sale				
West Fork Timber Creek Timber Sale	44	2013	In Progress	Timber Harvest
Sloway Thinning	26	2013	Completed	Precommercial Thinning
Fourmile Timber Sale	26	2013	In Progress	Timber Harvest
Club-Charette Fire Salvage	18	2014	In Progress	Fire Salvage Timber Harvest

IV. IMPACTS ON THE HUMAN POPULATION

- *RESOURCES potentially impacted are listed on the form, followed by common issues that would be considered.*
- *Explain POTENTIAL IMPACTS AND MITIGATIONS following each resource heading.*
- *Enter "NONE" If no impacts are identified or the resource is not present.*

14. **HUMAN HEALTH AND SAFETY:**
Identify any health and safety risks posed by the project.

Operation of logging equipment and log hauling on public roads could create a temporary hazard to individuals recreating and driving in and near the project area. Warning signs would be posted on roads and near harvest operations as a contract stipulation. Harvest Unit 3 and the haul route located on Fish Creek State Park land are the only portions of the project area that are accessible by unrestricted roads. This road system may be closed administratively during harvest operations to limit public exposure to log trucks and logging equipment. Considering the above mitigations, direct indirect and cumulative effects to human health and safety will be low.

15. INDUSTRIAL, COMMERCIAL AND AGRICULTURE ACTIVITIES AND PRODUCTION:
Identify how the project would add to or alter these activities.

The proposed project would supply approximately 1 MMBF of sawlogs for the manufacture of dimension and structural lumber, fiber products and biomass fuel at regional sawmills and processing facilities.

Because of the small size of the project, no direct, indirect or cumulative effects to industrial, commercial and agriculture activities would be expected.

16. QUANTITY AND DISTRIBUTION OF EMPLOYMENT:
Estimate the number of jobs the project would create, move or eliminate. Identify direct, indirect, and cumulative effects to the employment market.

The proposed project would provide employment for approximately 4 individuals for 6 months. Additionally, raw material generated by the project would likely be processed at local mills.

Because of the small size of the project, no long term direct, indirect or cumulative effects to quantity and distribution of employment are expected.

17. LOCAL AND STATE TAX BASE AND TAX REVENUES:

Estimate tax revenue the project would create or eliminate. Identify direct, indirect, and cumulative effects to taxes and revenue.

The proposed action would create short term employment for a logging contractor who would in turn pay federal and state income tax. Logs would likely be processed at local mills by mill employees who would pay income tax.

Due the temporary nature of the project and limited amount of volume harvested, it is unlikely that the proposed action would have any direct, indirect or cumulative effects to taxes and revenue.

18. DEMAND FOR GOVERNMENT SERVICES:

Estimate increases in traffic and changes to traffic patterns. What changes would be needed to fire protection, police, schools, etc.? Identify direct, indirect, and cumulative effects of this and other projects on government services

There would be no measurable direct, indirect or cumulative effects related to demand for government services due to the relatively small size of the project. There would be short-term increase in truck traffic but it would be considered normal to the local community and industrial base.

19. LOCALLY ADOPTED ENVIRONMENTAL PLANS AND GOALS:

List State, County, City, USFS, BLM, Tribal, and other zoning or management plans, and identify how they would affect this project.

20. ACCESS TO AND QUALITY OF RECREATIONAL AND WILDERNESS ACTIVITIES:

Identify any wilderness or recreational areas nearby or access routes through this tract. Determine the effects of the project on recreational potential within the tract. Identify direct, indirect, and cumulative effects to recreational and wilderness activities.

The parcels involved in the proposed action do not provide access to wilderness, but may provide access to some portions of the Fish Creek Wildlife Management Area or Fish Creek State Park. Project operating seasons would be limited to summer and early fall to avoid disturbing wintering ungulates, early avian nesting season, winter recreation and the general big game hunting season.

No direct, indirect or cumulative effects to recreation or wilderness access would be expected.

21. DENSITY AND DISTRIBUTION OF POPULATION AND HOUSING:

Estimate population changes and additional housing the project would require. Identify direct, indirect, and cumulative effects to population and housing.

The proposed action would likely provide temporary employment for local logging contractors and their employees.

As a result, there would be no anticipated changes to population and housing.

22. SOCIAL STRUCTURES AND MORES:

Identify potential disruption of native or traditional lifestyles or communities.

No native or traditional communities have been identified in or near the project area.

23. CULTURAL UNIQUENESS AND DIVERSITY:
How would the action affect any unique quality of the area?

No sites of unique qualities or cultural significance have been identified in the project area.

24. OTHER APPROPRIATE SOCIAL AND ECONOMIC CIRCUMSTANCES:
Estimate the return to the trust. Include appropriate economic analysis. Identify potential future uses for the analysis area other than existing management. Identify direct, indirect, and cumulative economic and social effects likely to occur as a result of the proposed action.

Costs, revenues and estimates of return are estimates intended for relative comparison of alternatives. They are not intended to be used as absolute estimates of return. The estimated stumpage is based on comparable sales analysis. This method compares recent sales to find market value for stumpage. These sales have similar species, quality, average diameter, product mix, terrain, date of sale, distance from mills, road building and logging systems, terms of sale, or anything that could affect a buyer's willingness to pay for timber.

Alternative A: Deferred Harvest (No Action)

No changes to current conditions would be expected under the No Action alternative.

Alternative B: Harvest (Action)

The proposed project would generate approximately $130,000(6,500 tons @ $20/ton) in revenue in support of the Public Buildings Trust and $22,750(6,500 tons @ $3.50/ton) in Forest Improvement funds.

EA Checklist Prepared By:	**Name:**	Wayne Lyngholm	**Date:**	August 23, 2013
	Title:	Management Forester		

V. FINDING

25. ALTERNATIVE SELECTED:

I select Alternative B the Harvest (Action) Alternative. This alternative best meets DNRC's obligation to manage these forested trust lands for the support of the Public Building beneficiary as described in state law 77-1-202 MCA.

26. SIGNIFICANCE OF POTENTIAL IMPACTS:

I find there are no significant environmental impacts.

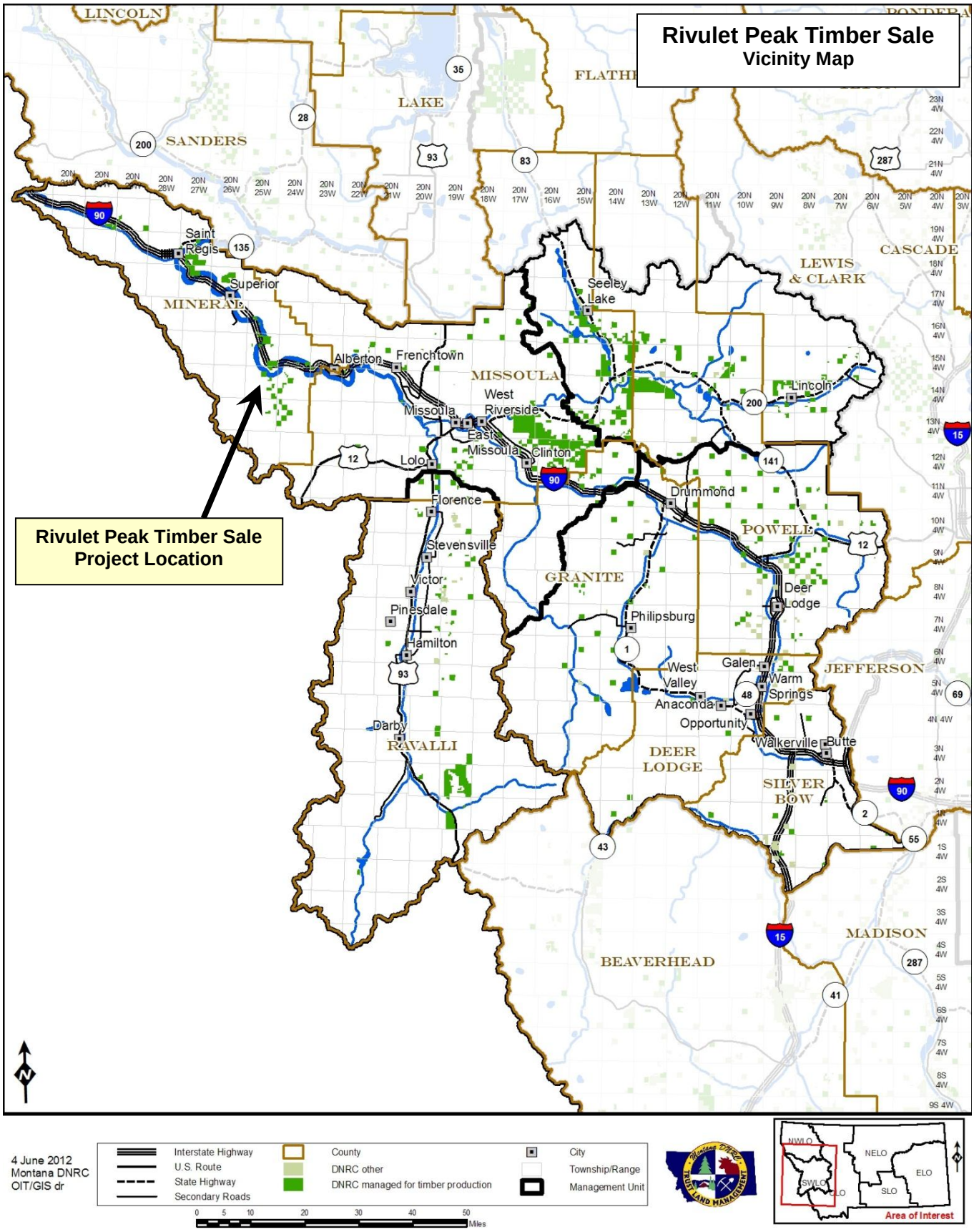
Portions of the original scoping proposal (3 sections and 3 million board foot harvest) have been deferred from treatment at this time to reduce the scope of the proposal. The project was designed with input from various resource specialists to minimize potential environmental effects. Numerous mitigations have been adopted to further minimize effects.
The severity, duration and geographic extent of proposed activities is not unusual; the probability of effects is reasonably certain; the growth inducing growth inhibiting aspects are relatively minor; the effects to the quality and quantity of environmental resources is minor; effects to important environmental resources is minor; the forest management activities proposed are in no way precedent setting; the proposal complies with all laws and is consistent with DNRC Administrative Rules for Forest Management, as well as the Habitat Conservation Plan between DNRC and the US Fish and Wildlife Service.

27. NEED FOR FURTHER ENVIRONMENTAL ANALYSIS:

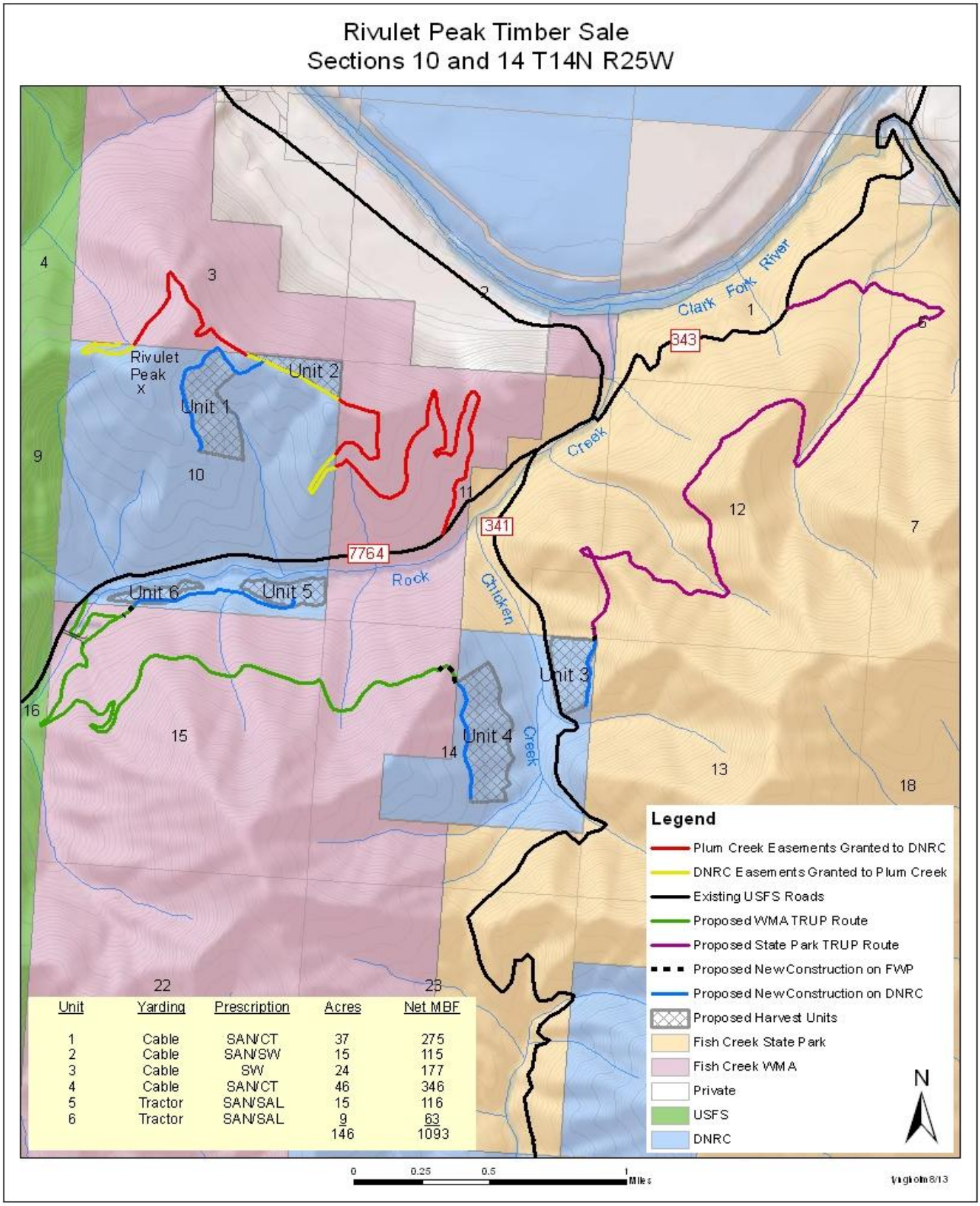
[ ]	EIS	[ ]	More Detailed EA	[X]	No Further Analysis

EA Checklist Approved By:	**Name:**	Robert H. Storer
	Title:	Trust Lands Program Manager – Southwest Land Office
Signature: // Robert H Storer		**Date**: February 28, 2014

Attachment A: Project Maps



Attachment A: Project Maps



Unit	Yarding	Prescription	Acres	Net MBF
1	Cable	SAN/CT	37	275
2	Cable	SAN/SW	15	115
3	Cable	SW	24	177
4	Cable	SAN/CT	46	346
5	Tractor	SAN/SAL	15	116
6	Tractor	SAN/SAL	9	63
			146	1093

Vegetation Analysis

Introduction

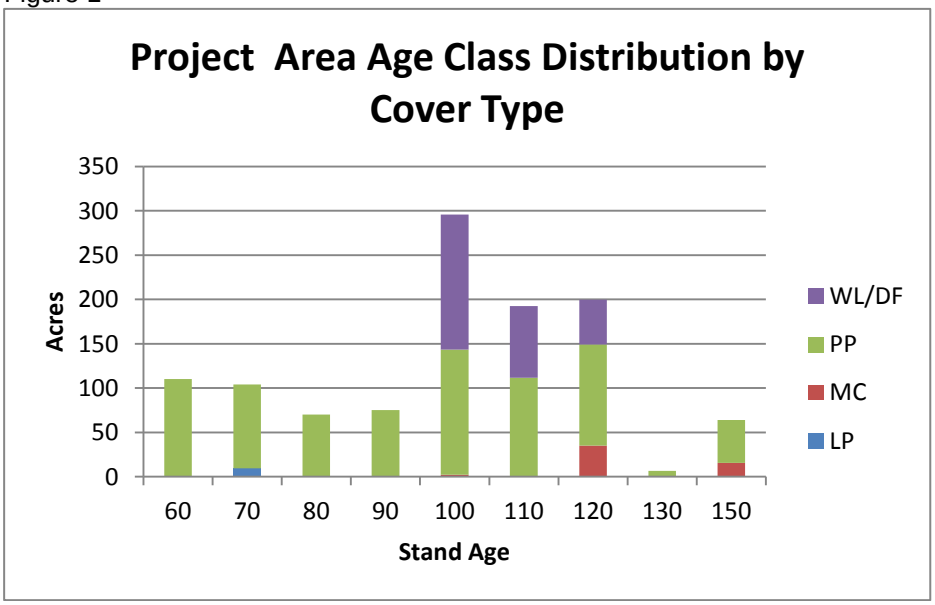
The DNRC performs an analysis of vegetation for proposed forest management projects to determine current conditions, appropriate treatments and the potential effects associated with a proposed activity. Analysis for the Rivulet PeakTimber Sale included review of the DNRC Stand Level Inventory (SLI), a query of the Montana Natural Heritage Program for the presence of sensitive plants, site review by the project IDT and a plot level inventory of stand conditions.

Stand Composition and Cover Types

Existing Conditions

Ponderosa pine cover type dominates the project area with western larch/Douglas-fir, mixed conifer and lodgepole pine cover types present. Current cover types and age class conditions (Figure 1) are the result of mixed severity fire and historic logging activity 90-110 years ago. The project area is generally composed of well stocked, multi-aged stands with multiple canopy layers and small canopy gaps created by recent insect and disease mortality. Larch dwarf mistletoe (*Arceuthobium laricis)* is common in project area western larch stands, resulting in heavy localized mortality, log defects and reduced tree growth (Hagle et. al, 2003)

Figure 1



1) Ponderosa pine cover type occupies approximately 806 acres of the project area, typically on more southerly and westerly aspects. Clumps of large emergent ponderosa pine and Douglas-fir relic trees and co-dominant second growth ponderosa pine occupy the overstory, while the middle canopy and understory are dominated by shade tolerant Douglas-fir and grand fir. Seral species are generally absent or poorly represented in the lower canopy. 5-15% estimated mortality of large mature ponderosa pine due to western pine beetle *(Dendroctonus brevicomis)* infestation is evident in most stands.

2) Approximately 284 acres of Western larch/douglas-fir cover types are present on north and east aspects. Western larch is heavily infected with dwarf-mistletoe in these stands, reducing productivity.

Intermediate and understory canopy layers are dominated by shade tolerant Douglas-fir and grand fir. 60-80% lodgepole pine mortality from mountain pine beetle infestation is occurring in these stands.

3) Mixed conifer and lodgepole pine cover types occupy 62 acres of the project area in riparian areas along Rock Creek and Chicken Creek. Mortality of lodgepole pine is high due to mountain pine beetle infestation in these stands.

Understory conditions range from dense ninebark and shrubs to talus rock slides. Moderate spotted knapweed infestations occur along a few existing roads. No sensitive plants have been identified in the project area. No old growth, as defined by Green et al, has been identified in the project area (Green et. al, 1992).

The DNRC maintains biodiversity by managing for appropriate stand structures and compositions on school trust lands. Appropriate stand cover types are determined by a site specific model that considers the ecological characteristics and estimated historical cover type conditions that existed on the site prior to European settlement. Cover type conditions in the project area are described in Table 1. Treatments were designed to maintain the appropriate cover type and improve age class distribution and species composition to achieve biodiversity and forest health objectives (ARM 36.11.405).

Table 1. Project Area Cover Type and Desired Future Condition

Cover Type	Current Acres	Percent of Project Area	Desired Future Condition Acres	Desired Future Condition Percent of Project Area
Ponderosa Pine	806	70%	916	80%
Western Larch/Douglas-fir	284	25%	236	20%
Mixed Conifer	53	5%	0	0%
Lodgepole Pine	9	1%	0	0%

Direct and Indirect Effects

Alternative A: Deferred Harvest (No Action)

No changes to existing vegetation communities would occur as a result of the proposed action. Mortality from insects and disease would likely continue or increase and shade tolerant Douglas-fir would likely become dominant. There would be low risk of direct or indirect effects under this alternative.

Alternative B: Harvest (Action)

The proposed treatment would reduce canopy cover by approximately 40-60% and live tree stocking by 60-70%. The largest trees present and mature healthy trees exhibiting desirable form and growth characteristics would be favored for retention as crop trees and seed source for future stands. Seral ponderosa pine and western larch would be favored for retention where present, particularly large ponderosa pine scattered throughout the project area. Cut and leave tree stocking data collected from proposed harvest units is described in Table 2. Leave trees in post-harvest stands would be retained on a 40 foot average spacing, but spacing would vary due to the clumpy nature of both large dominant leave trees and western larch cut trees infected with dwarf mistletoe.

Standing snags provide habitat for cavity nesting bird species, bat roosting sites and woodpecker foraging habitat. A plot level inventory of standing snags present in proposed harvest units was conducted in June, 2013 (Table 3). The majority of these snags were marked for retention.

Table 2. Cut and Leave Tree Stocking (Trees Per Acre) by DBH Class

DBH	Live Cut Trees	Dead Cut Trees	Live Leave Trees
6	2.5		
7	13.1		
8	15.8		
9	13.6		2.3
10	11.9		1.8
11	12.9	0.8	2.3
12	7.0		3.2
13	7.1		4.3
14	3.7		3.3
15	1.6		1.6
16	1.1		1.1
17	1.0		1.6
18	2.3		0.8
19	1.3		1.5
20	0.7	0.2	0.7
21	0.4		0.2
22	0.6		0.6
23	0.2		1.4
24	0.3		0.2
25			0.6
26			0.7
27			0.1
30			0.1
Total	**96.9**	**1.0**	**28.3**

Table 3. Standing Snags (≥20' tall) Per Acre by Species

Snag DBH Class	DF	GF	PP	WL	Total
10	0.92		0.92		1.84
11	0.76			0.76	1.52
12				0.64	0.64
13	0.54	0.54			1.08
17			0.63		0.63
18			0.57		0.57
19			0.25		0.25
20	0.69		0.46	0.23	1.38
21			0.21		0.21
22				0.38	0.38
23			0.35		0.35
24			0.16	0.16	0.32
34		0.08			.08
Total	**2.91**	**0.62**	**3.55**	**2.17**	**9.25**

On warm/moist and warm/wet Habitat Type Groups present in Harvest Units 5 and 6, the DNRC would retain a minimum of 2 snags and 2 snag recruits per acre over 21 inches DBH (Pfister et. al, 1977)(ARM 36.11.411). A minimum of 1 snag and 1 snag recruit over 21 inches DBH would be retained as required for other Habitat Type Groups present in Harvest Units 1-4.

Table 4: Harvest Treatments

Harvest Prescription	Description	Proposed Units	Acres
Sanitation/ Commercial Thin (SAN/CT)	Remove western larch heavily infected with dwarf-mistletoe and promote recruitment of seral species. Retain healthy dominant, codominant and large relic western larch, ponderosa pine and Douglas-fir on a 30-60 foot spacing.	Harvest Units 1 and 4	83
Sanitation/Shelterwood, (SAN/SW)	Remove western larch infected with dwarf-mistletoe and promote natural regeneration of seral species. Retain healthy dominant, codominant western larch, ponderosa pine and Douglas-fir on a 40-60 foot spacing as seed source.	Harvest Unit 2	15
Shelterwood (SW)	Retain healthy vigorous ponderosa pine and Douglas-fir on a 50-70 foot spacing to promote natural regeneration of seral species.	Harvest unit 3	24
Sanitation/Salvage (SAN/SAL)	Remove dead and pine beetle hit lodgepole pine and western larch infected with dwarf mistletoe. Retain healthy vigorous western larch, ponderosa pine and Douglas-fir on a 40-60 foot spacing.	Harvest Units 5 and 6	24

Cumulative Effects

Alternative A: Deferred Harvest (No Action)

No harvest would occur as a result of the proposed action. Permitted activities would continue in the project area. Programmatic weed management would continue.

In the absence of fire and forest management, gradual transition from seral species to shade tolerant Douglas-fir as the dominant species would be expected. Continued or increased mortality of ponderosa pine from western gall rust and western pine beetle would be likely. Accumulation of fuel from mortality and understory development of Douglas-fir would increase the risk of stand replacing fire.

Alternative B: Harvest (Action)

Active forest management in the project area would continue, resulting in periodic future harvest and vegetation management treatments. These would include future timber sales and precommercial thinning projects to meet stand composition and stocking objectives. Adjacent WMA and State Park lands are not expected to be managed for timber harvest in the foreseeable future. It is expected that there would be low risk of cumulative effects to vegetation communities as a result of the proposed action.

References

DNRC, 1996. State Forest Land Management Plan. Montana Department of Natural Resources and Conservation. Missoula, MT.

Green, P. J. Joy, D. Sirucek, W. Hann, A. Zack, and B. Naumann. 1992. Old-Growth forest types of the Northern Region. USDA Forest Service, Northern Region. Missoula, Montana.

Hagle,S.K., K.E. Gibson, S. Tunnock. 2003. Field Guide to Diseases and Insect Pests of Northern and Central Rocky Mountain Conifers. USDA Forest Service, Region 1. Missoula, MT.

MT DNRC. 2003 Montana Administrative Rules for Forest Management on DNRC Forested Lands. Montana DNRC. Trust Lands Management Division. Helena, MT.

Pfister, R.D., B. L. Kovalchik, S.F. Arno, and R.C. Presby. 1977 Forest habitat types of Montana. U.S. Department of Agriculture, Forest Service, Internountain Forest and Range Experiment Station, Ogden, Utah.

Rivulet Peak Timber Sale Wildlife Analysis

Issues and Concerns

Proposed activities could alter forested connectivity, wildlife corridors and or habitats within linkage zones, which could affect wildlife movements across the landscape.

Proposed activities could reduce snags and coarse woody debris densities, leading to a decline in the quality of habitat for wildlife species that are dependent on these resources, which could alter their survival and/or reproductive ability.

Proposed activities could negatively affect Canada lynx by altering lynx summer foraging habitat, winter foraging habitat, and other suitable habitat, rendering it unsuitable for supporting lynx.

Proposed activities could negatively affect bald eagles by reducing nesting and perching structures and/or disturbing nesting bald eagles

Proposed activities could reduce the amount and/or quality of fisher habitats, which could alter fisher use of the area.

Proposed activities may alter flammulated owl habitat by reducing canopy closure and increasing tree spacing, and could remove snags needed by flammulated owls for nesting.

Proposed activities could displace gray wolves from important habitats, particularly denning and rendezvous sites, and/or alter prey availability.

Proposed activities could reduce suitable nesting and foraging habitat for pileated woodpeckers, which could alter pileated woodpecker use of the area.

Proposed activities could reduce the amount and/or quality of wolverine habitats, which could alter wolverine use of the area.

Proposed activities could remove forest cover on big game winter range, which could reduce the carrying capacity of the winter range.

Issues Eliminated from Further Study

The following species were considered but eliminated from detailed study due to lack of habitat present: grizzly bear, black-backed woodpecker, Coeur d'Alene salamander, Columbian sharp-tailed grouse, common loon, , harlequin duck, mountain plover, northern bog lemming, peregrine falcon, and Townsend's big-eared bat. Thus there would be a low risk of adverse direct, indirect, or cumulative effects as a result of either alternative.

Suggested Wildlife Mitigations

- A DNRC biologist will be consulted if a threatened or endangered species is encountered to determine if additional mitigations that are consistent with the administrative rules for managing threatened and endangered species (ARM 36.11.428 through 36.11.435) are needed.
- Motorized public access will be restricted at all times on restricted roads that are opened for harvesting activities; signs will be used during active periods and a physical closure (gate, barriers, equipment, etc.) will be used during inactive periods (nights, weekends, etc.). These roads and skid trails would be reclosed to reduce the potential for unauthorized motor vehicle use.
- Snags, snag recruits, and coarse woody debris will be managed according to *ARM 36.11.411* through *36.11.414*, particularly favoring western larch and ponderosa pine. Clumps of existing snags could be maintained where they exist to offset areas without sufficient snags. Coarse woody debris retention would emphasize retention of downed logs of 15-inch diameter or larger.

- Contractors and purchasers conducting contract operations will be prohibited from carrying firearms while on duty.
- Food, garbage, and other attractants will be stored in a bear-resistant manner.
- Retention of patches of advanced regeneration of shade-tolerant trees, such as grand-fir, in units 1, 5, and 6 would break-up sight distances, provide horizontal cover, and provide forest structural attributes preferred by snowshoe hares and lynx.
- Provide connectivity for fisher, Canada lynx, bears, and a host of other species by maintaining corridors of unharvested and/or lighter harvested areas along riparian areas, ridge tops, and saddles.

Forested Habitat Connectivity and Wildlife Movements

Connectivity of forest cover between adjacent patches is important for promoting movements of species that are hesitant to cross non-forested areas and other openings. Effective corridors tend to be those that are relatively wide, unfragmented, diverse, and frequently are associated with riparian areas (Fischer and Fischenich 2000). Width of the travel corridor tends to determine the efficacy of the corridor for individual species. In general, a wider corridor would be more effective and provide for more species than a narrower one. Riparian areas and ridges often play an important role in providing connective corridors. Expanding on this, linkage zones are areas "between larger blocks of habitat where animals can live at certain seasons and where they can find the security they need to successfully move between these larger habitat blocks" (Servheen et al. 2003). Linkage zones are important because they provide for dispersal and gene flow among larger areas of suitable habitats. As such, both corridors and linkage zones can become compromised through human management and environmental changes (e.g., fires or floods).

The project area currently contains approximately 757 acres of mature stands (100-plus years in age) of Douglas-fir, Douglas-fir/western larch, and ponderosa pine stands that have a reasonably closed canopy. Currently, forested areas cover most of the project area, facilitating some use by those species requiring connected-forested conditions. The project area is partially within a potential linkage zone that provides broad-scale landscape connectivity for forest carnivores (grizzly bear, Canada lynx, and wolverine) from the Northern Continental Divide Ecosystem to the Selway-Bitterroot Mountains, and was near the area identified for linkage across Highway 90 (Servheen et al. 2003). Within these linkage zones, Servheen recommends the following to maintain the effectiveness of these areas for wildlife movement: 1) no additional site developments such as campgrounds, boat ramps or trailheads where human activity and human-related attractants like garbage and foods are concentrated; 2) no increase in motorized access routes or motorized use areas; and 3) maintenance or enhancement of visual cover in these areas so as to make wildlife more secure when they move through such areas.

The cumulative effects analysis area is approximately 31,803 acres and includes the area bounded by the Clark Fork River, Fish Creek, West Fork Fish Creek, North Fork Fish Creek, St. Patrick Peak, St. Patrick Creek, and Quartz Creek. DNRC manages a small component (7%; 2,260 acres) of the cumulative effects analysis area; the major land holders in the cumulative effects analysis area include USFS (56%) and DFWP (31%). Chicken Creek and Rock Creek in particular are used extensively by big game, bears and carnivores. Across the cumulative effects analysis area, connectivity has been reduced by past timber management, residential development, recent wildfires, the Highway 90 corridor, and the land ownership patterns in the area. Past timber management on former industrial timberlands, USFS, and DNRC lands, as well as on privately owned lands in the cumulative effects analysis area has altered landscape connectivity. Future planned developments in Fish Creek State Park could affect habitat security in this connectivity area.

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Snags and coarse woody debris

Snags and coarse woody debris are important components of forested ecosystems. Snags and defective trees (e.g. partially dead, spiked top, broken top) are used by a wide variety of wildlife species for nesting, denning, roosting, feeding, and cover. Snags and defective trees may be the most valuable individual component of Northern Rocky Mountain forests for wildlife species (Hejl and Woods 1991). The quantity, quality, and

distribution of snags affect the presence and population size of many of these wildlife species relying on these resources. Snags provide foraging sites for insectivorous species and offer opportunities for primary cavity-nesting species to excavate nests. The cavities created by primary excavators (i.e. woodpeckers) also provide habitat for secondary cavity users, including other birds and small and mid-sized mammals. Snags and defective trees can also provide nesting sites for secondary cavity users where cavities are formed by broken tops and fallen limbs. Larger, taller snags tend to provide nesting sites, while shorter snags and stumps tend to provide feeding sites (Bull et al. 1997). Many species that use smaller-diameter snags will also use large snags; however, the opposite is not true. Typically, older-aged stands will have greater numbers of large snags. Finally, snag densities are another important aspect of habitat value for cavity-nesting birds, as many of these species tend to nest in areas where snag densities are high, using one snag for nesting, but having others nearby for foraging or roosting opportunities.

Coarse woody debris provides food sources, areas with stable temperatures and moisture, shelter from the environment, lookout areas, and food-storage sites for several wildlife species. Several mammals rely on deadwood for survival and reproduction. The size, length, decay, and distribution of woody debris affect their capacity to meet these life requisites. Single, scattered downed trees could provide lookout and travel sites for squirrels or access under the snow for small mammals and weasels, while log piles provide foraging sites for weasels and denning sites for lynx.

An average of 1.34 large (greater than 21 inches dbh) snags per acre were observed, which were largely dominated by ponderosa pine and western larch. Smaller-sized snags were also variable in the project area, with an average of 3.03 snags (15 to 21inches dbh) per acre, which were dominated by ponderosa pine. Generally, evidence of snag use for feeding and/or cavity building was observed across the project area. Coarse woody debris levels were also variable across the project area. Open roads in portions of the project area has facilitated some firewood gathering, which has affected snag and coarse woody debris levels in the vicinity of those open roads. The cumulative effects analysis area encompasses the project area and lands within a one mile radius. Past harvesting in the cumulative-effects analysis area has reduced the availability of snags and snag recruits while increasing coarse woody debris levels; any ongoing harvesting would also be expected to reduce snags and snag recruits while potentially increasing coarse woody debris levels. Firewood gathering is prohibited on adjacent wildlife management area lands, however some level of illegal firewood cutting still occurs there. Snags and coarse woody debris are frequently collected for firewood within the Fish Creek drainage, especially near open roads, and firewood gathering commonly occurs in the cumulative-effects analysis area.

Threatened and Endangered Species

Canada Lynx

Canada lynx are associated with subalpine forests, generally between 4,000 to 7,000 feet in elevation in western Montana (Ruediger et al. 2000). The proposed project area ranges from approximately 3,160 to 4,760 feet in elevation and is dominated by ponderosa pine, Douglas-fir, and Douglas-fir/western larch types. Lynx habitat in western Montana consists primarily of stands that provide habitat for snowshoe hares, either dense, young coniferous stands or dense, mature forested stands. Lynx in western Montana preferred mature, multi-storied stands with dense horizontal cover year-round; during the summer lynx also selected earlier successional stands with a high horizontal cover (Squires et al. 2010). For denning sites, the primary component appears to be abundant large woody debris, particularly in the form of downed logs, root wads, slash piles, and live trees (Squires et al. 2008). These conditions are found in a variety of climax vegetation habitat types, particularly within the subalpine fir series (Pfister et al. 1977). Historically, high intensity, stand-replacing fires of long fire intervals (150 to 300 years) occurred in continuous dense forests of lodgepole pine, subalpine fir, and Engelmann spruce. These fires created extensive even-aged patches of regenerating forest intermixed with old stands that maintained a mosaic of snowshoe hare and lynx habitat.

Approximately 287 acres of lynx habitat occur in the project area. Much of this habitat was identified as winter foraging (218 acres), with lesser amounts of other suitable habitats (largely forested lands that provide cover to facilitate movement; 69 acres). Connectivity of forested habitats within the project area is fairly intact. The cumulative effects analysis area is approximately 31,803 acres and includes the area bounded by the Clark Fork River, Fish Creek, West Fork Fish Creek, North Fork Fish Creek, St. Patrick Peak, St. Patrick Creek, and Quartz Creek. DNRC manages a small component (7%; 2,260 acres) of the cumulative effects analysis area; the major

land holders in the cumulative effects analysis area include USFS (56%) and DFWP (31%). Potential lynx habitats exist on roughly 421 acres of DNRC-managed lands in the cumulative effects analysis area, which is dominated by winter foraging habitats (308 acres), with smaller components of other suitable habitats (75 acres) and temporary non lynx habitats (38 acres); most of the habitats on DNRC-managed lands in the cumulative effects analysis area are not likely suitable for lynx (1,694 acres). On other ownerships in the cumulative effects analysis area, habitats are largely a mix of Douglas-fir types with some ponderosa pine, western larch, lodgepole pine, and mixed conifers with a moderate amount of open types (herbaceous, shrub, sparse vegetation, water). Those areas in appropriate lynx covertypes on other ownerships likely support a mixture of winter foraging, other suitable lynx habitats, summer foraging, and temporary non lynx habitats. In general, there are portions of the cumulative effects analysis area that appear to contain more suitable lynx habitats, but the portions closer to the project area generally contain marginal lynx habitats and limited use would be anticipated. Connectivity in the cumulative effects analysis area has been compromised by past timber harvesting, the Highway 90 corridor, recent wildfires, and the land ownership patterns in the area. Past timber management on former industrial timberlands, USFS, and DNRC lands, as well as on privately owned lands in the cumulative effects analysis area has altered landscape connectivity.

Sensitive Species

Bald Eagle

Bald eagles are diurnal raptors associated with significant bodies of water, such as rivers, lakes, and coastal zones. The bald eagle diet consists primarily of fish and waterfowl, but includes carrion, mammals, and items taken from other birds of prey. In Montana, bald eagles begin the breeding process with courtship behavior and nest building in early February; the young fledge by approximately mid-August, ending the breeding process. Preferred nest-stand characteristics include large emergent trees that are within sight distances of lakes and rivers and screened from disturbance by vegetation.

The project area is within the home range associated with the Fish Creek bald eagle territory; additionally a small portion of the project area in section 10 also is in the home range associated with the Tarkio bald eagle territory. The Fish Creek territory has been fairly productive with an average of 1 chick produced annually over the last 8 years, with 2 unknown outcome years included. Direct, indirect, and cumulative effects were analyzed on the home range associated with the Fish Creek bald eagle territory. The aquatic habitat associated with the bald eagle territory includes Clark Fork River, Fish Creek, Chicken Creek, Rock Creek, and numerous smaller streams. Aquatic and terrestrial prey species are fairly common in the home range. The terrestrial habitats in the Fish Creek home range are a mixture of coniferous/deciduous forests along the riparian areas, with coniferous forests in the upland areas. Within the home range, large emergent conifers provide important nesting, roosting, and perching habitats, as cottonwood trees are generally lacking in the Clark Fork River canyon.

Human disturbance, including timber harvesting, the Highway 90 corridor, numerous human residences, and various forms of recreation are potential sources of disturbance to the nesting territory. Numerous large emergent trees are available across portions of the home range, but timber management and other human developments in the last 100 years has likely reduced some of these attributes while others have experienced mortality and are declining in quality.

Fisher

Fishers are a mid-sized forest carnivore whose prey includes small mammals such as voles, squirrels, snowshoe hares, and porcupines, as well as birds (Powell and Zielinski 1994). They also take advantage of carrion and seasonally available fruits and berries (Foresman 2001). Fishers use a variety of successional stages, but are disproportionately found in stands with dense canopies (Powell 1982, Johnson 1984, Jones 1991, Heinemeyer and Jones 1994) and avoid openings or young forested stands (Buskirk and Powell 1994). However, some use of openings may occur for short hunting forays or if sufficient overhead cover (shrubs, saplings) is present. Fishers appear to be highly selective of stands that contain resting and denning sites and tend to use areas within 150 feet of water (Jones 1991). Resting and denning sites are found in cavities of live trees and snags, downed logs, brush piles, mistletoe brooms, squirrel and raptor nests, and holes in the ground. Forest-management considerations for fisher involve providing for resting and denning habitats near riparian areas while maintaining travel corridors.

There are approximately 183 acres of potential upland fisher habitats and 39 acres of riparian habitats in the project area. The cumulative effects analysis area is approximately 31,803 acres and includes the area bounded by the Clark Fork River, Fish Creek, West Fork Fish Creek, North Fork Fish Creek, St. Patrick Peak, St. Patrick Creek, and Quartz Creek. DNRC manages a small component (7%; 2,260 acres) of the cumulative effects analysis area; the major land holders in the cumulative effects analysis area include USFS (56%) and DFWP (31%). The cumulative effects analysis area includes roughly 26 miles of Class 1 and 90 miles of Class 2 streams. Within the cumulative effects analysis area, there are roughly 30,138 acres that would be classified as upland (more than 100 ft from Class 1 and more than 50 feet from Class 2 streams) and 1,740 acres that would be classified as riparian that are associated with the 116 miles of streams in the cumulative effects analysis area. There are roughly 1,983 acres of upland types and 132 acres of riparian types on lands managed by DNRC in the cumulative effects analysis area. Potential fisher habitats exist on approximately 318 acres (270 upland and 48 riparian acres) of DNRC-managed lands; likely some additional habitats exist on a portion of the mature forest on adjacent ownerships in the cumulative effects analysis area, particularly along portions of those riparian areas. Additionally, on other ownerships in the cumulative effects analysis area, stands in preferred covertypes that are lacking sufficient structure to be suitable fisher habitats could development those attributes through time with advancing succession.

Flammulated Owl

Flammulated owls are tiny, migratory, insectivorous forest owls that inhabit old, open stands of warm-dry ponderosa pine and cool-dry Douglas-fir forests in the western United States and are secondary cavity nesters. In Montana flammulated owls appear to initiate nesting later than most of the other owl species; they generally initiate nesting in May, and nestlings usually fledge during August. In general, preferred habitats have open to moderate canopy closure (30-50 percent) with at least 2 canopy layers, and are often near small clearings. They usually nest in cavities excavated by pileated woodpeckers or northern flickers in 12-25" dbh ponderosa pine, Douglas-fir, or aspen. Without disturbance, Douglas-fir encroach upon ponderosa pine stands resulting in increased stand density and decreased habitat quality for flammulated owls. Periodic, low-intensity underburns can increase habitat suitability and sustainability by reducing the density of understory seedlings and saplings, stimulating shrub growth, and by protecting large dominant trees from ladder fuels and competition with other mature trees.

There are approximately 439 acres of potential flammulated owl habitats in ponderosa pine and dry Douglas-fir stands across the project area. The cumulative effects analysis area encompasses the project area and lands within a one mile radius. Within the cumulative-effects analysis area, approximately 510 acres of potential flammulated owl habitats (which includes the 439 acres within the project area) exist on DNRC-managed lands. Additionally, some suitable habitats likely exist on a portion of the 4,681 acres of open and closed forested habitats on other ownerships in the cumulative effects analysis area, which are dominated by Douglas-fir and ponderosa pine types. A portion of the cumulative effects analysis area has been harvested in the recent past, potentially improving flammulated owl habitat by creating foraging areas and reversing a portion of the Douglas-fir encroachment and opening up stands of ponderosa pine.

Gray Wolf

Wolves are a wide-ranging, mobile species that occupy a wide variety of habitats that possess adequate prey and minimal human disturbance, especially at den and/or rendezvous sites. Wolves are opportunistic carnivores that frequently take vulnerable prey (including young individuals, older individuals, and individuals in poor condition). In general, wolf densities are positively correlated to prey densities (Fuller et al. 1992, Oakleaf et al. 2006). In Montana, wolves prey primarily on white-tailed deer and elk (Kunkel et al. 1999, Arjo et al. 2002). Thus, reductions in big game populations and/or winter range productivity could indirectly be detrimental to wolf populations.

Wolves typically den during late April in areas with gentle terrain near a water source (valley bottoms), close to meadows or other openings, and near big game wintering areas. When the pups are 8 to 10 weeks old, wolves leave the den site and start leaving their pups at rendezvous sites while hunting. These sites are used throughout the summer and into the fall. Disturbance at den or rendezvous sites could result in avoidance of these areas by the adults or force the adults to move the pups to a less adequate site. In both situations, the risk of pup mortality increases.

Winter range exists in the project area for white-tailed deer, mule deer, and elk. Several landscape features commonly associated with denning and rendezvous sites occur in the project area, such as areas with gentle

terrain near a water source (valley bottoms) and proximity to big game wintering areas. The project area is in the annual home range of the Quartz Creek wolf pack. This pack has likely been in existence since 2008, has never been considered a breeding pack, and has apparently been reduced in size on a couple of occasions due to hunting. Some use of the project area by wolves could be occurring for breeding, hunting, or other life requirements.

The cumulative effects analysis area is approximately 31,803 acres and includes the area bounded by the Clark Fork River, Fish Creek, West Fork Fish Creek, North Fork Fish Creek, St. Patrick Peak, St. Patrick Creek, and Quartz Creek. DNRC manages a small component (7%; 2,260 acres) of the cumulative effects analysis area; the major land holders in the cumulative effects analysis area include USFS (56%) and DFWP (31%). Within this cumulative-effects analysis area, big game species are fairly common and winter range for deer and elk exists along the lower portions of the cumulative effects analysis area. Numerous landscape features commonly associated with denning and rendezvous sites, including meadows and other openings near water and in gentle terrain, occur in the cumulative-effects analysis area. Past harvesting and human developments have altered big game and wolf habitats in the cumulative effects analysis area.

Pileated Woodpecker

The pileated woodpecker is one of the largest woodpeckers in North America and excavates the largest cavities of any woodpecker. Preferred nest trees are large diameter western larch, ponderosa pine, cottonwood, and quaking aspen trees and snags, usually 20 inches dbh and larger. Pileated woodpeckers primarily eat carpenter ants, which inhabit large downed logs, stumps, and snags. Aney and McClelland (1985) described pileated nesting habitat as "...stands of 50 to 100 contiguous acres, generally below 5,000 feet in elevation with basal areas of 100 to 125 square feet per acre and a relatively closed canopy." The feeding and nesting habitat requirements, including large snags or decayed trees for nesting and downed wood for feeding, closely tie these woodpeckers to mature forests with late-successional characteristics. The density of pileated woodpeckers is positively correlated with the amount of dead and/or dying wood in stands (McClelland 1979).

In the project area, potential pileated woodpecker nesting habitat exists on approximately 540 acres. These nesting habitats are dominated by Douglas-fir, Douglas-fir/western larch, and ponderosa pine types. Additionally, 374 acres of sawtimber stands dominated by ponderosa pine and Douglas-fir exist in the project area, which are potential foraging habitats. Pileated woodpeckers have been seen and/or heard in the project area during several field visits and may be nesting on the parcel. The cumulative effects analysis area encompasses the project area and lands within a one mile radius. In the cumulative effects analysis area, a total of 606 acres of potential pileated nesting habitats exist on DNRC-managed lands; potential lower quality foraging habitats exists on roughly 461 acres of sawtimber stands on DNRC-managed lands in the cumulative effects analysis area. Potential pileated woodpecker nesting and foraging habitats likely exist on much of the 2,579 acres of forested habitats on other ownerships in the cumulative effects analysis area that are fairly densely stocked. Much of the 2,101 acres of open forest and/or young forest on other ownerships in the cumulative effects analysis area is likely too open to be useful to pileated woodpeckers; similarly 1,640 acres of sparsely vegetated, herbaceous vegetation, shrubs, and open water in the cumulative effects analysis area are not likely providing pileated habitats and would not be expected to provide habitats for pileated woodpeckers for a very long time, if ever.

Wolverine

Wolverines are highly mobile and solitary carnivores that inhabit remote areas and occur at relatively low densities (Banci 1994). Generally wolverines are found at high elevations centered near treeline; habitats consist of coniferous forests below treeline, rocky alpine habitats above treeline, and cirque basins and avalanche chutes. These areas are characterized by having cool to cold temperatures year round and rather deep and persistent snow well into the spring (Copeland et al. 2010). Wolverines are well-adapted for life in snowy-environments and success of wolverine may relate to the availability of large areas of remote, rugged uplands that are difficult to access by humans (Hatler 1989). Wolverines consume a variety of foods depending upon availability, including scavenging carrion (caribou, deer, elk, and moose), small animals (snowshoe hare, squirrels, marmots, and small mammals), birds, fruits, berries, and insects (Banci 1994). The availability and distribution of food is likely the primary factor in the large home range sizes of wolverines, but search for mates in these low-density predators may also contribute to the large home range sizes.(Banci 1994). Wolverines are dependent on persistent spring snow for successful reproduction (Copeland et al. 2010) where female wolverine den in a series of long complex snow tunnels that may or may not be associated with large boulders, fallen

trees, or other complex structures beneath the persistent snow (Magoun and Copeland 1998). In general, year-round habitat use takes place almost entirely in the area defined by deep persistent snow (Copeland et al. 2010). Lower elevation forested habitats appear to only be used for dispersal movements and not for foraging or reproduction. There is some evidence that although wolverines will use more open areas above treeline, grass-shrub habitats were largely avoided, perhaps due to warmer temperatures, lack of snow, and a general lack of prey availability (Copeland et al. 2007). Wolverines have few natural predators, but some evidence exists that wolverines are occasionally attacked and/or killed by wolves, bears, mountain lions, and other wolverines; human-caused mortality may be one of the primary mortality factors in wolverines (Banci 1994). Forest-management considerations for wolverines involve providing for connectivity across the landscape to maintain the functional nature of the meta-population, which requires migration and gene flow between these semi-isolated subpopulations.

In the northern Rockies, wolverines tend to select for habitats above 7,200 feet; elevations in the project area range between 3,160 and 4,760 feet. Additionally, wolverines generally do not utilize winter ranges (Copeland et al. 2007), possibly to avoid other, larger predators that frequent ungulate winter ranges. Winter ranges for deer and elk are located in the project area. No areas of deep persistent spring snow occur in the project area, but the project area is within a few miles of a fairly large patch of persistent spring snow, which may be suitable for use by wolverine (Copeland et al. 2010). Also, historical harvest data reveals use of wolverine in nearby drainages, including Quartz Creek and others. Overall some transient use of the project area by wolverine could occur.

The cumulative effects analysis area is approximately 31,803 acres and includes the area bounded by the Clark Fork River, Fish Creek, West Fork Fish Creek, North Fork Fish Creek, St. Patrick Peak, St. Patrick Creek, and Quartz Creek. DNRC manages a small component (7%; 2,260 acres) of the cumulative effects analysis area; the major land holders in the cumulative effects analysis area include USFS (56%) and DFWP (31%). Within the cumulative-effects analysis area, a trace amount of persistent spring snow exists on the western edge of the cumulative effects analysis area. In the cumulative effects analysis area, the variety of stands likely provides a suite of potential food sources; winter range is common in the lower elevation areas of the cumulative effects analysis area as well. Connectivity of forested habitats in the cumulative effects analysis area has been compromised by past timber harvesting, the Highway 90 corridor, recent wildfires, and the land ownership patterns in the area. Past timber management on former industrial timberlands, USFS, and DNRC lands, as well as on privately owned lands in the cumulative effects analysis area has altered landscape connectivity.

Big Game

Big Game Winter Range

Winter ranges enable big game survival by minimizing the effects of severe winter weather conditions. Winter ranges tend to be relatively small areas that support large numbers of big game, which are widely distributed during the remainder of the year. These winter ranges have adequate midstory and overstory to reduce wind velocity and intercept snow. The effect is that temperatures are moderated and snow depths are lowered, which enables big game movement and access to forage with less energy expenditure than in areas with deeper snow and colder temperatures. Snow depths differentially affect big game; white-tailed deer are most affected, followed by mule deer, elk, and then moose. Thus, removing cover that is important for wintering big game through forest management activities can increase their energy expenditures and stress in winter, but may increase forage production for use on summer range. Reductions in cover could ultimately result in a reduction in winter range carrying capacity and subsequent increases in winter mortality within local big game herds.

Montana Department of Fish, Wildlife, and Parks identified white-tailed deer (112 acres), mule deer (281 acres), and elk (725 acres) winter range in the project area. These winter ranges are part of larger winter ranges in the area. Mature Douglas-fir, ponderosa pine, and mixed conifer stands in the project area are providing attributes facilitating use by wintering big game. Evidence of non-winter use by deer and elk was noted throughout the project area during field visits.

A variety of stands across the 205,962-acre winter range, used for the cumulative effects analysis area, are presently providing thermal cover and snow intercept for big game. In the recent past, harvesting and wildfires have reduced thermal cover, snow intercept, habitat security and forest connectivity. Ongoing harvesting across ownerships in the cumulative effects analysis area could continue altering these attributes while potentially

disturbing wintering big game. Portions of the cumulative effects analysis area have been converted to agriculture and other human developments and would not be expected to provide thermal cover or snow intercept in the future. Human disturbance within the winter range is associated with residential development, agricultural clearing, recreational snowmobile use, commercial timber management, Highway 90, and numerous secondary roads.

Environmental Consequences

Forested Habitat Connectivity and Wildlife Movements

Direct and Indirect Effects of the No-Action Alternative

No appreciable changes to existing stands would be anticipated. Stands providing forested cover that may be functioning as corridors, including riparian areas, saddles, and ridgelines, would not be altered. Similarly, no changes in habitats within the linkage zone would be anticipated. No changes in human developments, motorized access, or visual screening would occur. No changes in wildlife use would be expected. Thus, no direct or indirect effects to forested habitat connectivity and wildlife movements would be expected since: 1) no changes to existing stands would occur; 2) no changes to human developments, motorized access, or visual screening would occur, and 3) no alterations to existing corridors or habitats within linkage zones would be anticipated.

Cumulative Effects of the No-Action Alternative

No appreciable changes to existing stands would be anticipated. Stands providing forested cover that may be functioning as corridors, including riparian areas, saddles, and ridgelines, would not be altered. Similarly, no changes in habitats within the linkage zone would be anticipated. Past harvesting has reduced the amount of mature, forested habitats in portions of the cumulative effects analysis area; however, continued successional advances are moving stands toward mature forests. This alternative would continue to contribute to the mature forested stands in the cumulative-effects analysis area. No changes in human developments, motorized access, or visual screening would occur. No changes in wildlife use would be expected. Thus, no cumulative effects to forested habitat connectivity and wildlife movements would be expected since: 1) no changes to existing stands would occur; 2) no changes to human developments, motorized access, or visual screening would occur, and 3) no alterations to existing corridors or habitats in linkage zones would be anticipated.

Direct and Indirect Effects of the Action Alternative

Proposed activities could disturb a variety of wildlife when activities would be occurring. Approximately 146 acres of mature Douglas-fir and western larch/Douglas-fir stands with a closed canopy would be harvested. The majority of those acres would receive treatments that would reduce habitat quality for those species relying on mature, closed-canopied forested habitats. Proposed treatments would create more open stands that may not be used by wildlife species that use mature stands to move through the landscape; however corridors, particularly along ridges, draws, and other topographic features, would be retained. The proposed treatments could also modify suitable habitats in the linkage zone. The only permanent human development constructed would be roughly 2.35 miles of new, restricted road, which may provide minor increases in non-motorized use, but would not appreciably concentrate human activity beyond the proposed activities. New road construction would contribute to an increase in total road density. Furthermore contract stipulations would minimize the presence of human-related attractants during the duration of the proposed activities. No changes in motorized human access would occur in the project area. Some changes in visual screening would occur within individual units, but the combination of irregular-shaped units, topography, and considerable unharvested patches throughout the project area would minimize the effect of the reductions in visual screening. Thus, a minor risk of adverse direct and indirect effects to forested habitat connectivity and wildlife movements would be expected since: 1) proposed activities could reduce forested cover in a portion of the project area; 2) minor changes in human developments would occur, but no changes in human developments that would concentrate human activity or human-related attractants would occur except during harvesting operations; 3) no changes to motorized human access would occur; and 4) visual screening in portions of the project area would be reduced, but considerable visual screening would be retained across the project area.

Cumulative Effects of the Action Alternative

Proposed harvesting would reduce forested habitats that may be a part of existing corridors or suitable habitats within larger linkage zones, but corridors would persist. The modifications could cause shifts in habitat usage by some wildlife species using the corridors along Rock and Chicken Creek. Across the cumulative effects analysis area, a variety of stands are providing for wildlife movements. The proposed activities would not appreciably alter the ability of the linkage zone to meet habitat needs for those wildlife species commonly requiring linkage zones. No appreciable changes in the presence of human developments would occur, particularly no changes in the presence of human-related attractants or concentrations of human activities beyond the short duration of proposed activities would. No changes to motorized access to the cumulative effects analysis area would occur. Negligible reductions in visual screening in a small portion of the cumulative effects analysis area would occur. Thus, a minor risk of adverse cumulative effects to forested habitat connectivity and wildlife movements would be expected since: 1) proposed activities could reduce forested cover in a small portion of the cumulative effects analysis area, but corridors would exist; 2) negligible changes in human developments would occur, but no changes in human developments that would concentrate human activity or human-related attractants would occur; 3) no changes to motorized human access would occur; and 4) visual screening in a small portion of the cumulative effects analysis area would be reduced, but considerable visual screening would persist across the cumulative effects analysis area.

Snags and Coarse Woody Debris

Direct and Indirect Effects of the No-Action Alternative

No direct changes in the deadwood resources would be expected. Existing snags would continue to provide wildlife habitats, and new snags would be recruited as trees die. Coarse woody debris would persist without other disturbances influencing its distribution and quality. Continued decay and decline in existing snags and trees would continue to contribute to the coarse woody debris in the project area. Thus, negligible direct and indirect effects would be anticipated to snags, coarse woody debris, and subsequently to those wildlife species requiring these habitat attributes since: 1) no harvesting would occur that would alter present or future snag or coarse woody debris concentrations, and 2) no changes to human access for firewood gathering would occur.

Cumulative Effects of the No-Action Alternative

Snags and coarse woody debris would not be altered in the project area. The species composition of future snags could be altered with changing species composition in the stands due to advances in succession. Across the cumulative effects analysis area, snags have not always been retained during the past harvesting activities. Wildlife species in the cumulative-effects analysis area that rely on snags and coarse woody debris would be expected to persist. Thus, no cumulative effects to snags and coarse woody debris would be anticipated since: 1) no further harvesting that could alter snag densities would occur; and 2) no change in the level of firewood gathering would be expected.

Direct and Indirect Effects of the Action Alternative

Present and future snags and coarse woody debris could be reduced due to timber harvesting on 146 acres in the project area. Portions of the project area adjacent to open roads or in stands that lack larger snags would not see appreciable changes in the availability of large snags and/or coarse woody debris since these attributes are currently somewhat limited in those areas. Snags (approximately 1.34 large snags and 3.9 large leave trees and snag recruit trees per acre) and coarse woody debris (emphasizing retention of logs 15 inches dbh and larger) would be planned for retention in the proposed harvest areas. However, some snags and/or recruit trees could be lost due to safety and operational concerns, but replacements would be identified in order to stay in compliance with *ARM 36.11.411*. Future snag quality in the harvested areas would be enhanced with proposed silvicultural prescriptions that should lead to the reestablishment of shade-intolerant species that tend to provide important habitats, such as long-lasting nesting structures and foraging habitats, for cavity nesting birds. Given the amounts, range of variability in sizes, and decay classes of snags and coarse woody debris present in the project area, prescriptions aiming to maintain a variety of these resources would benefit the suite of species that rely on these habitat components. No changes in human access would occur and no changes to the potential risk for snag and coarse woody debris loss due to firewood gathering would occur. Thus, minor adverse direct and indirect effects to snags and coarse woody debris would be anticipated that would affect wildlife species

requiring these habitat attributes since: 1) harvesting would reduce snags and snag-recruitment trees while increasing coarse woody debris levels; and 2) no changes to human access for firewood gathering would occur.

Cumulative Effects of the Action Alternative

Some snags and coarse woody debris could be removed from the project area, while others may be recruited. Across the cumulative-effects analysis area, snags and coarse woody debris are somewhat limited. The losses of snags and coarse woody debris associated with this alternative would be additive to the losses associated with past harvesting, recent wildfires, as well as ongoing firewood gathering. However, the project would retain snags, snag recruits, and coarse woody debris. No change in human access would be anticipated; thus, no changes to the potential loss of snags and coarse woody debris due to firewood gathering would occur. Wildlife species that rely on snags and coarse woody debris in the cumulative-effects analysis area would be expected to persist at similar levels, albeit slightly lower numbers in proposed units following treatment. Thus, minor adverse effects to wildlife species requiring snags and coarse woody debris would be anticipated in the cumulative-effects analysis area since: 1) a small, but cumulative amount of the cumulative-effects analysis area would be harvested, reducing snags and snag-recruit trees while increasing coarse woody debris levels; and 2) no changes in access for the general public and associated firewood gathering would be anticipated

Threatened and Endangered Species

Canada Lynx

Direct and Indirect Effects of the No-Action Alternative

In the short-term, no changes in lynx habitat elements would be expected in the project area. In the longer-term, barring any major natural disturbances, natural succession would advance several classes forward, generally improving several classes of lynx habitats; however, summer foraging habitats would continue to be absent in the project area. Winter foraging habitats would be expected to remain at similar levels, or increase in the future, as shade-tolerant trees develop in the understory and coarse woody debris accumulates through time due to natural events. Landscape connectivity would not be altered. Thus, a negligible risk of adverse direct and indirect effects to Canada lynx would be expected since: 1) existing winter foraging habitats would persist; 2) summer foraging habitats would be absent; 3) the amount of temporary non-suitable habitats would not increase; and 4) landscape connectivity would not be altered.

Cumulative Effects of the No-Action Alternative

No appreciable change in lynx habitats in the cumulative effects analysis area would occur, except the continued maturation of stands. Winter foraging habitats would be expected to improve in the future as shade-tolerant trees continue to develop in the understory, coarse woody debris accumulates through time due to natural events, and, in general, stands continue maturing out of summer foraging and other suitable habitats. No lynx habitats would develop on the suite of lands that are not in appropriate lynx covertypes, such as ponderosa pine stands. No appreciable changes to landscape connectivity would be anticipated. Thus, a negligible risk of adverse cumulative effects to lynx would be expected since: 1) winter foraging habitats would persist in the cumulative effects analysis area; 2) summer foraging habitats would continue maturing and longer-term availability of summer foraging habitats would likely decline without disturbance; 3) no changes in the amount of temporary non-suitable habitat would occur; and 4) landscape connectivity would not be altered.

Direct and Indirect Effects of the Action Alternative

Approximately 57 acres of lynx habitats (48 acres winter foraging and 10 acres other suitable lynx habitats; 20% of lynx habitats in the project area) would be altered with proposed activities. These habitats would be converted to other suitable lynx habitats with smaller areas of temporary non-suitable habitats, based on the densities of trees retained. The more open stands created with this alternative could provide some summer foraging habitats in the future, as tree seedlings and shrubs recover and begin providing habitats for snowshoe hares. Retention of patches of advanced regeneration of shade-tolerant trees, such as grand-fir, in units 1, 5, and 6, would break-up sight distances, provide horizontal cover, and provide forest structural attributes preferred by snowshoe hares and lynx. Overall the total amount of lynx habitats in the project area that is in the temporary non-lynx habitat class would increase slightly, and would not exceed 20%. Forest connectivity could

be altered, but would be maintained with several corridors being retained along riparian areas, draws, ridges, and other topographic features. Collectively, a minor risk of adverse direct and indirect effects to Canada lynx would be expected since: 1) winter foraging habitats would be reduced; 2) summer foraging habitats would continue to be absent, but some future summer foraging habitats could be created; 3) the amount of the project area in the temporary non-suitable lynx habitat category would increase to a maximum of 20%; and 4) connectivity could be altered, but corridors would be maintained.

Cumulative Effects of the Action Alternative

Within the cumulative-effects analysis area, lynx habitats would continue to persist. Reductions in winter foraging coupled with the increases in other suitable and temporary non-suitable habitats on the portions of the cumulative effects analysis area managed by DNRC could slightly decrease the quality of the lynx habitats in the cumulative effects analysis area. Near-term increases in summer foraging habitats could occur in a portion of the cumulative effects analysis area. Anticipated reductions in lynx habitats would be additive to past losses from timber harvesting and any ongoing modifications in the cumulative-effects analysis area. A moderate amount (<15%) of the DNRC-managed lands in the cumulative effects analysis area would be in the temporary non-lynx habitats, meaning most of the lynx habitats would be in a usable state for lynx. No lynx habitats would develop on the suite of lands that are not in appropriate lynx covertypes, such as ponderosa pine stands. Forest connectivity would not be appreciably altered within the cumulative effects analysis area. Thus, a minor risk of adverse cumulative effects to Canada lynx would be expected since: 1) adequate winter foraging habitats would persist; 2) summer foraging habitats could continue developing for the next 10 to 30 years; 3) moderate amounts of lynx habitats would be in the temporary non-lynx habitat category, meaning most of the lynx habitats would be in a usable state for lynx; and 4) negligible alterations in landscape connectivity would not prevent lynx movements.

Sensitive Species

Bald Eagle

Direct and Indirect Effects of the No-Action Alternative

No direct or indirect effects to bald eagles would be anticipated since: 1) no changes to human disturbance levels would occur; and 2) no changes in the availability of large, emergent trees suitable for perching or nesting would be expected.

Cumulative Effects of the No-Action Alternative

No cumulative effects to bald eagles would be anticipated since: 1) no changes to human disturbance levels would occur; and 2) no changes in the availability of large, emergent trees would be expected.

Direct and Indirect Effects of the Action Alternative

Proposed harvesting would not occur in the nest area or primary use areas associated with the bald eagle territory; proposed harvesting would occur on 146 acres in the home range of the bald eagle territory. Proposed activities could occur during the last portion of the nesting season (July 1- August 15) or during the non-nesting period. The haul route would be along the Rivulet Road, and these activities would be somewhat visible to eagles in the vicinity of the Fish Creek nest. Given the distance from the nest and the timing of proposed activities, negligible disturbance to bald eagles would occur. Minor reductions in the availability of large snags and emergent trees that could be used as nest or perch trees could occur in the home range, but an average of 3.9 large trees and 1.34 large snags per acre (see Vegetation section) would be retained that would be usable by bald eagles. No changes to human access to the home range would occur, thus limiting potential for introducing additional human disturbance to this territory. Thus, a negligible risk of direct and indirect effects to bald eagles would be anticipated since: 1) disturbance could be slightly elevated within the home range during operations; 2) no change in human access within the project area would occur; and 3) minor reductions in the availability of large, emergent trees would be expected in the fringe areas of their territories, but none in the high use areas along the Clark Fork River.

Cumulative Effects of the Action Alternative

Nesting bald eagles would continue to experience varying levels of disturbance. Any potential disturbance and/or noise from the proposed harvesting would be additive to any of these other forms of disturbance, however no changes in bald eagle behavior would be anticipated. Equipment and timber hauling would take place along the Rivulet Road where it could be visible to the bald eagle nest, however most activities would take place outside the nesting season or at the very end of the nesting season when very large chicks might be present. Minor reductions in availability of large snags or emergent trees that could be used as nest or perch trees could occur in the home range. No changes to human access to the home range would occur, thereby limiting potential for introducing additional human disturbance to this territory. Thus, a negligible risk of cumulative effects to bald eagles would be anticipated since: 1) disturbance could be slightly elevated within the territory during harvesting operations, should they occur during the nesting season; 2) no changes in human access within the territory would occur; and 3) minor reductions in the availability of large, emergent trees would be expected.

Fisher

Direct and Indirect Effects of the No-Action Alternative

No direct and indirect effects to fishers in the project area would be anticipated since: 1) no changes to existing habitats would be anticipated; 2) landscape connectivity would not be altered further; 3) no appreciable changes to snags, snag recruits, and coarse woody debris levels would be anticipated; and 4) no changes to human access or the potential for trapping mortality would be anticipated.

Cumulative Effects of the No-Action Alternative

No further cumulative effects to fishers would be anticipated in the cumulative-effects analysis area since: 1) no changes to existing habitats on DNRC-managed land would occur; 2) landscape connectivity afforded by the stands on DNRC-managed lands would not change appreciably; 3) no changes to snags, snag recruits, or coarse woody debris levels would be expected; and 4) no changes to human access or the potential for trapping mortality would be anticipated.

Direct and Indirect Effects of the Action Alternative

Trace amounts of riparian habitats would be altered with this alternative, in a couple of spots in unit 6 where small portions of the unit exist between the 95 foot mark and the 100 foot mark from Rock Creek. Approximately 30 of the 183 acres (16%) of upland fisher habitats in the project area would receive treatments; the majority of this area would receive a sanitation/commercial thinning-type treatment, which would reduce overstory density, but would likely still be suitable for fisher following proposed treatments. No changes in open roads would be anticipated, which would not likely alter trapping pressure and the potential for fisher mortality. Negligible reductions in landscape connectivity could occur with the proposed activities, but activities would avoid riparian areas. Thus, a minor risk of adverse direct and indirect effects to fisher would be anticipated since: 1) harvesting would essentially avoid riparian areas; 2) harvesting would modify upland fisher habitats; 3) negligible reductions in landscape connectivity would occur, but those areas associated with riparian areas would remain largely unaffected; 4) harvesting would reduce snags and snag-recruitment trees while increasing coarse woody debris levels; however, some of these resources would be retained; and 5) no appreciable changes in motorized human-access levels would be anticipated.

Cumulative Effects of the Action Alternative

Given that the prescriptions within mapped fisher habitats would reduce canopy closure, but likely retain sufficient cover to be suitable for fishers, no changes to the amount of riparian or upland habitats available for fishers would be anticipated. Generally, riparian and upland foraging and travel habitats would continue to be present on DNRC-managed lands in the cumulative effects analysis area as well as across the larger cumulative-effects analysis area. No appreciable changes to landscape connectivity would be anticipated, and activities would avoid riparian areas commonly used by fisher. No appreciable changes in human disturbance and potential trapping mortality would be anticipated. Thus, a minor risk of adverse cumulative effects to fisher

would be anticipated since: 1) harvesting would modify upland fisher habitats, and considerable upland habitats would persist; 2) no appreciable changes in landscape connectivity would be anticipated, and connectivity in riparian areas would not be altered; 3) harvesting in a relatively small portion of the cumulative-effects analysis area could partially reduce snags and snag recruits, while increasing the coarse woody debris levels, largely in the smaller-sized pieces; and 4) no appreciable changes to motorized human access would occur.

Flammulated Owl

Direct and Indirect Effects of the No-Action Alternative

Existing flammulated owl habitats in the project area would persist. With advancing succession, stands could continue to become densely stocked and exist at high risk to insects, disease and stand-replacement fire. Therefore, habitat sustainability and quality for flammulated owls would continue to decline. Thus, a negligible risk of adverse direct and indirect effects to flammulated owls would be anticipated since: 1) no harvesting would occur; 2) no changes to potential nesting habitats would be anticipated; and 3) long-term, succession-related declines in foraging habitats coupled with advancing succession leading to denser stands.

Cumulative Effects of the No-Action Alternative

Existing flammulated owl habitats would persist. Recent timber management across the cumulative effects analysis area has potentially improved flammulated owl habitats by creating foraging habitats and reversing a portion of the Douglas-fir encroachment, however retention of large ponderosa pine and/or Douglas-fir was not necessarily a consideration in some of these harvest units, thereby minimizing the benefits to flammulated owls. Areas exhibiting mature forested conditions would be expected to persist and could provide flammulated owl nesting habitats into the future. Thus, a negligible risk of adverse cumulative effects to flammulated owls would be anticipated since: 1) no harvesting would occur, 2) no changes to potential nesting habitats would be anticipated, and 3) long-term, succession-related declines in foraging habitats coupled with advancing succession leading to denser, less suitable foraging conditions.

Direct and Indirect Effects of the Action Alternative

Flammulated owls are tolerant of human disturbance (McCallum 1994), however the elevated disturbance levels associated with proposed activities could negatively affect flammulated owls should activities occur during the nesting season. Proposed activities would overlap the nestling and fledgling period. Since most snags would be retained, loss of nest trees should be minimal. Proposed timber harvest on 146 acres, including 58 acres of potential flammulated owl habitats would open the canopy while favoring western larch, ponderosa pine, and Douglas-fir. Elements of the forest structure important for nesting flammulated owls, including snags, coarse woody debris, numerous leave trees, and snag recruits would be retained in the proposed units. The more open stand conditions, the retention of fire adapted tree species, and the maintenance of snags would move the proposed project area toward historical conditions, which is preferred flammulated owl habitat. Thus, minor positive direct and indirect effects would be expected to flammulated owls since: 1) harvesting would open denser stands up; 2) elements of forest structure used for foraging and nesting by flammulated owl would be retained; and 3) prescriptions would lead to more open stands with scattered mature ponderosa pine.

Cumulative Effects of the Action Alternative

Proposed harvesting would increase the amount of the cumulative-effects analysis area that has been recently harvested, which would add to the amount of potential habitat available, but possibly at the expense of losing snags and large trees important for nesting. Overall a slight improvement in habitat quality at the cumulative-effects analysis level could be realized with this alternative. The portions of the cumulative-effects analysis area not currently providing flammulated owl habitats would not be expected to change any time in the future. Thus, negligible beneficial cumulative effects to flammulated owls would be expected since: 1) harvesting would improve the quality and sustainability of flammulated owl habitat on a portion of the cumulative effects analysis area; and 2) a small increase in the amount of the cumulative-effects analysis area would be anticipated that would be more representative of historic conditions.

Gray Wolf

Direct and Indirect Effects of the No-Action Alternative to Gray Wolves

Disturbance to wolves would not increase. No changes in big game habitat, including no changes to big game winter ranges, would be expected during the short-term; therefore, no changes in wolf prey availability would be anticipated. Thus, no direct and indirect effects would be expected to gray wolves since: 1) no changes in human disturbance levels would occur; and 2) no changes to prey availability would occur.

Cumulative Effects of the No-Action Alternative to Gray Wolves

White-tailed deer and elk winter ranges would not be affected and substantive changes in big game populations, distribution, or habitat use would be not anticipated. Levels of human disturbance would be expected to remain similar to present levels. Past harvesting and any ongoing harvesting may cause shifts in big game use and, subsequently, gray wolf use, of the cumulative-effects analysis area; however, no changes would be anticipated that would alter levels of gray wolf use of the cumulative-effects analysis area. Thus, no further cumulative effects to gray wolves would be expected since: 1) no changes in human disturbance levels would occur; and 2) no changes to prey availability would occur.

Direct and Indirect Effects of the Action Alternative to Gray Wolves

Wolves using the area could be disturbed by harvesting activities. After harvesting activities, human disturbance levels would likely revert to pre-harvest levels. Likewise, wolf use of the project area for denning and rendezvous sites would likely revert to pre-harvest levels. In the short-term, the proposed harvesting could lead to shifts in big game use, which could lead to a shift in wolf use of the project area. Harvesting on approximately 100 acres of winter range would modify roughly 14% of the stands in the project area with dense canopies that are providing some thermal cover and snow intercept. Collectively, the modifications to summer and winter range would likely alter big game use of the project area, and subsequently alter the use of the project area by wolves. Thus, a low risk of direct and indirect effects would be expected to gray wolves since: 1) minor short-term increases and no long-term changes in human disturbance levels would occur; and 2) changes to summer and winter big game habitats would alter big game use of the project area, but would not appreciably alter prey availability.

Cumulative Effects of the Action Alternative to Gray Wolves

Reductions in thermal cover and snow intercept capacity on a portion of the winter range in the cumulative effects analysis area could redistribute the big game relying on those habitats, and subsequently shift wolf use of a small portion of the cumulative effects analysis area. Reductions in cover may cause slight decreases in use by deer and elk; however, no appreciable changes would be expected within the cumulative-effects analysis area. These reductions in cover would be additive to losses from past timber-harvesting activities as well as any ongoing harvesting in the cumulative-effects analysis area. No changes in motorized human access would be anticipated. No substantive change in wolf use of the cumulative-effects analysis area would be expected; wolves could continue to use the area in the long-term. Thus, a low risk of cumulative effects to gray wolves would be expected since: 1) elevated human disturbance levels would be short-lived and negligible changes to long-term disturbance levels would be anticipated; and 2) modifications to big game winter range could alter big game distributions, but would not appreciably alter prey availability.

Pileated Woodpecker

Direct and Indirect Effects of the No-Action Alternative

No disturbance of pileated woodpeckers would occur. Forest succession and natural disturbance agents would continue to bring about changes in existing stands. Thus, a negligible risk of adverse direct and indirect effects to pileated woodpeckers would be expected since: 1) no further harvesting would occur; 2) no changes in the amount of continuously forested habitats would be anticipated; 3) no appreciable changes to existing pileated woodpecker habitats would be anticipated; and 4) long-term, succession-related declines in the abundance of shade-intolerant tree species, which are valuable to pileated woodpeckers, would be anticipated.

Cumulative Effects of the No-Action Alternative

No disturbance of pileated woodpeckers would occur. Continued use of the cumulative-effects analysis area by pileated woodpeckers would be expected at similar levels as presently occurring. Thus, a negligible risk of adverse cumulative effects to pileated woodpeckers would be expected since: 1) no further changes to existing habitats would occur; 2) no further changes to the amount of continuously forested habitats available for pileated woodpeckers would be anticipated; and 3) long-term, succession-related changes in the abundance of shade-intolerant tree species, which are valuable to pileated woodpeckers, would occur.

Direct and Indirect Effects of the Action Alternative

Pileated woodpeckers tend to be somewhat tolerant of human activities (Bull and Jackson 1995), but might be temporarily displaced by the proposed harvesting and any other activities that may occur during the nesting period. Little disturbance to pileated woodpeckers would be anticipated should the proposed activities occur during the non-nesting period. Pileated woodpeckers could be displaced from feeding sites within the project area when proposed activities would be occurring. Harvesting would reduce continuously-forested habitats for pileated woodpeckers. Roughly 61 acres of the potential nesting habitat and an additional 80 acres of potential foraging habitats would be modified, some to the point of being temporarily unusable for pileated woodpeckers following proposed treatments. Potential pileated woodpecker habitats would be reduced for 30-100 years, depending on the density of trees retained. Elements of the forest structure important for nesting pileated woodpeckers, including snags (1.34 large snags per acre), coarse woody debris, numerous leave trees (3.9 large leave trees per acre), and snag recruits would be retained in the proposed harvest areas. Since pileated woodpecker density is positively correlated with the amount of dead and/or dying wood in a stand (McClelland 1979), pileated woodpecker densities in the project area would be expected to be reduced on 146 acres. The silvicultural prescriptions would retain healthy western larch, ponderosa pine, and Douglas-fir while promoting the growth and/or regeneration of many of these same species, which would benefit pileated woodpeckers in the future by providing nesting, roosting, and foraging habitats. Thus, a minor risk of adverse direct and indirect effects to pileated woodpeckers would be anticipated since: 1) harvesting would reduce the amount of continuous-forested habitats available; 2) potential nesting and foraging habitats would be altered, which could alter the suitability of those habitats for pileated woodpeckers; 3) snags and snag recruits would be removed; however, mitigation measures to retain snags and snag recruits would be included, and 4) proposed treatments would promote seral species in the project area.

Cumulative Effects of the Action Alternative

Reductions in pileated woodpecker habitats and further modifications in the amount of continuously forested habitats available in the cumulative effects analysis area would occur. Several snags, coarse woody debris, and potential nesting trees would be retained in the project area; however, future recruitment of these attributes may be reduced in a portion of the area by the proposed activities. Any modifications to pileated woodpecker habitats under this alternative would be additive to modifications associated with past timber harvesting; continued use of the cumulative-effects analysis area would be expected. Additionally, continued maturation of stands across the cumulative-effects analysis area is increasing suitable pileated woodpecker habitats. Thus, some risk of adverse cumulative effects to pileated woodpeckers would be anticipated since: 1) harvesting would further decrease the amount of continuous forested habitats available in the cumulative-effects analysis area, but forested habitats would persist; 2) potential nesting and foraging habitats would be modified, but habitats would persist in the cumulative-effects analysis area; 3) snags and snag recruits would be removed; however, mitigation measures would retain some of these attributes; and 4) proposed treatments would promote seral species in a small portion of the cumulative effects analysis area.

Wolverine

Direct and Indirect Effects of the No-Action Alternative

A negligible risk of adverse direct and indirect effects to wolverine would be expected since: 1) no activities would occur in areas that support persistent spring snow; and 2) no changes in landscape connectivity would occur.

Cumulative Effects of the No-Action Alternative

A negligible risk of adverse cumulative effects to wolverine would be expected since: 1) no changes to areas supporting persistent spring snow would occur; and 2) no alterations to landscape connectivity would occur.

Direct and Indirect Effects of the Action Alternative

Activities would occur outside of any areas that support persistent spring snow. Harvesting could alter some of the continuously-forested habitats in the project area; however the majority of these stands would likely retain sufficient canopy closure to continue to be useful for connectivity purposes. Some connectivity would be provided by retaining corridors along riparian areas, draws, ridges, and other topographic features. Thus, a minor risk of adverse direct and indirect effects to wolverine would be anticipated since: 1) no activities would occur in areas that support persistent spring snow; and 2) harvesting would alter the amount of continuous-forested habitats, but landscape connectivity would be partially retained in the project area.

Cumulative Effects of the Action Alternative

Activities would occur outside of any areas that support persistent spring snow. Harvesting would alter some of the continuously-forested habitats; however, the majority of these stands would likely retain sufficient canopy closure to continue to be useful for connectivity purposes. Some connectivity would be provided by retaining corridors along riparian areas, draws, ridges, and other topographic features. Ongoing harvesting in the cumulative effects analysis area would continue to alter landscape connectivity. A negligible risk of adverse cumulative effects to wolverine would be expected since: 1) no changes to areas supporting persistent spring snow would occur; and 2) a slight reduction in landscape connectivity could occur, but some connectivity would be maintained.

Big Game

Direct and Indirect Effects of the No-Action Alternative

No direct or indirect effects to big game winter range would be anticipated since: 1) the levels of human disturbance would remain similar; 2) subtle changes in thermal cover due to mortality and successional advances increasing canopy densities would be anticipated; and 3) the amount of mature forested habitats on the winter range would not change appreciably.

Cumulative Effects of the No-Action Alternative

Continued winter use of the larger winter range would be expected. No further changes in thermal cover and snow intercept would be anticipated. Human disturbance levels would be anticipated to continue at similar levels. Thus, no adverse cumulative effects to big game winter range would be anticipated since: 1) the levels of human disturbance would remain similar; 2) subtle changes in thermal cover due to advances in succession that would increase canopy densities would be anticipated over time; and 3) the amount of mature forested habitats on the winter range would not change.

Direct and Indirect Effects of the Action Alternative

Displacement of wintering big game would not be expected given the proposed operating season (July 1 – October 15). The proposed treatments on approximately 99 acres of winter range (14% of winter range in the project area) would open up existing stands, reducing habitat attributes that facilitate concentrated winter use by big game. Portions of some of the proposed units could continue to function as winter range while other portions would be too open to be used by wintering big game depending on the density of trees retained in those areas. Collectively, the reductions in thermal cover and snow intercept would require 40-60 years for suitable sized trees (>40 ft. tall) to develop in the stand. Proposed timber harvesting would not prevent big game movement through the project area appreciably in winter and could stimulate browse production within the units. Thus, a minor risk of adverse direct or indirect effects to big game winter range would be anticipated since: 1) disturbance to wintering big game would not occur; 2) a relatively small amount of the winter range in the project area would be altered; and 3) harvesting would alter and/or remove the mature forested habitats that are providing thermal cover and snow intercept habitats for big game species.

Cumulative Effects of the Action Alternative

No further disturbance or displacement of wintering big game would be anticipated. Thermal cover and snow intercept would be altered in the project area (< 0.05% of the larger winter range), which would further reduce the amount of the larger winter range providing these attributes for big game. Any harvesting that may be occurring on other ownerships in the cumulative effects analysis area could continue altering big game winter range. Thus, a minor risk of adverse cumulative effects to big game would be anticipated since 1) no further disturbance to wintering big game would occur; 2) a very small percentage of the larger winter range would be altered; 3) harvesting would alter and/or remove the mature forested habitats that are providing thermal cover and snow intercept for big game species in a small portion of the cumulative effects analysis area.

Literature Cited:

Aney, W. and R. McClelland. 1985. Pileated Woodpecker Habitat Relationships (revised). Pages 10-17 in Warren, N. eds. 1990. Old Growth Habitats and Associated Wildlife Species in the Northern Rocky Mountains. USFS, Northern Region, Wildlife Habitat Relationships Program R1-90-42. 47pp.

Arjo, W. M., D. H. Pletscher, and R. R. Ream. 2002. Dietary Overlap between Wolves and Coyotes in Northwestern Montana. Journal of Mammalogy. 83:754-766.

Banci, V. 1994. Wolverine. Pp 99-127 in L. F. Ruggiero, K. B. Aubry, S. W. Buskirk, L. J. Lyon, and W. J. Zielinksi, editors. The scientific basis for conserving forest carnivores: American marten, fisher, lynx, and wolverine in the western united States. USDA Forest Service Rocky Mountain Forest and Range Experiment Station, General Tech. Report RM-254, Fort Collins, Colorado, USA.

Bull, E. L., and J. A. Jackson. 1995. Pileated woodpecker: Dryocopus pileatus. American Ornithologists' Union. Washington DC. 24pp.

Bull, E.L., C. G. Parks, and T. R. Torgersen. 1997. Trees and Logs Important to Wildlife in the Interior Columbia River Basin. General Technical Report PNW-391. USDA Forest Service, Pacific Northwest Research Station, Portland, OR. 55pp.

Buskirk, S.W., and R.A. Powell. 1994. Habitat ecology of fishers and American martens. Pages 283-296 *in* Buskirk, S.W., A. Harestad, M. Raphael, eds. Biology and conservation of martens, sables and fishers. Cornell University Press, Ithaca, NY.

Copeland, J. P., K.S. McKelvey, K.B. Aubry, A. Landa, J. Persson, R.M. Inman, J. Krebs, E. Lofroth, H. Golden, J.R. Squires, A. Magoun, M.K. Schwartz, J. Wilmot, C.L. Copeland, R.E. Yates, I. Kojola, and R. May. 2010. The bioclimatic envelope of the wolverine (*Gulo gulo*): do climatic constraints limit its geographic distribution? Can. J. Zool. 88: 233-246.

Copeland, J. P., J. M. Peek, C. R. Groves, W. E. Melquist, K. S. McKelvey, G. S. McDaniel, C. D. Long, and C. E. Harris. 2007. Seasonal habitat associations of the wolverine in central Idaho. Journal of Wildlife Management. 71(7).

Fischer, R.A. and J.C. Fischenich. 2000. Design recommendations for riparian corridors and vegetated buffer strips. US Army Engineer Research and Development Center. Vicksburg, MS. ERDC TN-EMRRP-SR-24. April 2000. 17 pp.

Fuller, T. K., W. E. Berg, G. L. Radde, M. S. Lenarz, and G. B. Joselyn. 1992. A History and Current Estimate of Wolf Distribution and Numbers in Minnesota. Wildlife Society Bulletin 20:42-55.

Foresman, K.R.. 2001. The wild mammals of Montana. Special Publication 12. American Society of Mammalogists. Allen Press, Kansas. 278pp.

Hatler, D. F. 1989. A wolverine management strategy for British Columbia. Wildlife Bulletin No. B-60. B.C. Ministry of Environment, Wildlife Branch. Victoria, BC. 124 pp.

Heinemeyer, K. S., and J. L. Jones. 1994. Fisher biology and management in the western United States: A literature review and adaptive management strategy. USDA Forest Service, Northern Region, Missoula, Montana. 108pp.

Hejl, S. J. and R. E. Woods. 1991. Bird Assemblages in Old-Growth and Rotation-Aged Douglas-Fir/Ponderosa Pine Stands in the Northern Rocky Mountains: A Preliminary Assessment. Pages 93-100 *in*

D. M. Baumgartner and J. E. Lotan, eds. Proc. Symposium: Interior Douglas-fir: The Species and Its Management. Washington State University, Pullman, WA. 306pp.

Johnson, S. 1984. Home range, movements, and habitat use of fishers in Wisconsin. M.S. Thesis, University Wisconsin, Stevens Point. 78pp.

Jones, J.L. 1991. Habitat use of fisher in north-central Idaho. M.S. Thesis, University of Idaho, Moscow, Idaho. 147 pp.

Kunkel, K., T.K. Ruth, D.H. Pletscher, and M.G. Hornocker. 1999. Winter Prey Selection by Wolves and Cougars in and near Glacier National Park, Montana. Journal of Wildlife Management 63:901-910.

Magoun, A.J. & Copeland, J.P. 1998: Characteristics of wolverine reproductive den sites. Journal of Wildlife Management 62: 1313-1320.

McCallum, D. A. 1994. Review of technical knowledge: flammulated owls. Pages 14-46 *in* G. D. Hayward and J. Verner, tech eds. Flammulated, boreal, and great gray owls in the United States: a technical conservation assessment. USDA Forest Service Gen. Tech. Rep. RM-253. Fort Collins, Colorado.

McClelland, B.R. 1979. The pileated woodpecker in forests of the Northern Rocky Mountains. Pages 283-299 *in* Role of insectivorous birds in forest ecosystems. Academic Press.

Oakleaf, J.K., D. L. Murray, J. R. Oakleaf, E. E. Bangs, C. M. Mack, D. W. Smith, J. A. Fontaine, M. D. Jimenez, T. J. Meier, and C. C. Niemeyer. 2006. Habitat Selection by Recolonizing Wolves in the Northern Rocky Mountains of the United States. Journal of Wildlife Management 70:554-563.

Pfister, R., B. Kovalchik, S. Arno, and R. Presby. 1977. Forest Habitat Types of Montana. USDA Forest Service General Technical Report INT-34. Intermountain Forest and Range Experiment Station Ogden, UT. 174pp.

Powell, R. 1982. The fisher: National history, ecology, and behavior. University of Minnesota Press, Minneapolis, Minnesota. 217pp.

Powell, R. A. and W. J. Zielinski. 1994. Fisher. Pages 38-73 in Ruggiero, L. F., K. B. Aubry, S. W. Buskirk, L. J. Lyon, and W. J. Zielinski, tech eds. The scientific basis for conserving forest carnivores: American marten, fisher, lynx, and wolverine in the western United States. USDA Forest Service Gen. Tech. Rep. RM-254. Fort Collins CO.

Ruediger, B., J. Claar, S. Mighton, B. Nanaey, T. Tinaldi, F. Wahl, N. Warren, D. Wenger, A. Williamson, L. Lewis, B. Holt, G. Patton, J. Trick, A. Vandehey, and S. Gniadek. 2000. Canada Lynx Conservation Assessment (2nd Edition). USDA Forest Service, USDI Fish and Wildlife Service, USDI Bureau of Land Management, and USDI National Park Service. Missoula, MT. 122 pp.

Servheen, C., J. S. Waller and P. Sundstrom. 2003. Identification and management of linkage zones for wildlife between large blocks of public land in the northern Rocky Mountains. U.S. Fish and Wildlife Service. Missoula, MT. 83 pp.

Squires, J.R., N.J. DeCesare, J.A. Kolbe, and L. F. Ruggiero. 2010. Seasonal resource selection of Canada lynx in managed forests of the Northern Rocky Mountains. Journal of Wildlife Management 74:1648-1660.

Squires, J. R., N. J. DeCesare, J. A. Kolbe, and L. F. Ruggiero. 2008. Hierarchical den selection of Canada lynx in western Montana. Journal of Wildlife Management 72:1497–1506.

November 19, 2013

TO: Wayne Lyngholm, Jon Hansen, Jeff Rupkalvis, Jon Hayes, Garrett Schairer
FROM: Jeff Collins, Hydrologist
RE: Rivulet Timber Sale, Resource Report on Soils, Watershed, Fisheries, & Noxious Weeds

Introduction and Issue Statements

The following report describes the existing conditions of soils, water resources, fisheries and noxious weed management for the proposed Rivulet Timber Sale. This report includes the environmental assessments of the expected direct, indirect and cumulative effects of the project for these resources.

Issues and Concerns

The following issue statements were developed from internal and public scoping regarding the effects of the proposed timber harvest and road systems to water resources, fisheries, soils and noxious weeds. For specific comments and concerns, refer to the project file.

- Soil Resources – There is a concern that forest management activities may result in increased erosion and reduced soil productivity where excessive disturbance from compaction, displacement, or loss of nutrients occurs, depending on the extent and degree of harvest related soil effects.

- Water Resources - There is a concern that the proposed action may cause impacts to water quality and quantity from timber management, road construction and road use.

Cumulative Watershed Effects- There is a concern that the proposed timber harvest and increased road density may cause or contribute to cumulative watershed impacts as a result of increased runoff response and erosion potential.

- Cold Water Fisheries- The proposed forest management actions may have effects to fisheries due to sedimentation.

  a) Rock Creek, Chicken Creek and Trail Creek support westslope cutthroat trout and comments were received to avoid timber harvest in the Streamside Management Zones.

  b) Public comments were received of a concern for additional road construction and potential cumulative effects of increased road density on streams.

- Noxious weeds- There are a concern that the proposed forest management activities may introduce or spread noxious weeds, and that disturbed roads should be reseeded.

Recommended Mitigation Measures for Soil, Water Resources and Noxious Weed Management

- DNRC would implement all applicable Best Management Practices (BMP's), Montana Administrative Rules for Forest Management, and reasonable mitigation and erosion control practices during timber harvest, road maintenance, and road construction and road use activities. The commitments of the DNRC Habitat Conservation Plan (HCP) would be implemented on the parcels.

- DNRC would locate, clearly mark and maintain suitable water resource protection boundaries including Streamside Management Zones (SMZ's), Riparian Management Zones (RMZ's), and Wetland Management Zones (WMZ's) adjacent to streams and wetlands consistent with the HCP and the State Forest Land Management Rules.

- The north boundary lines of harvest Units 5 & 6 are located on a terrace edge that parallels Rock Creek. A minimum 94 ft RMZ boundary (based on the forest stand potential tree height) would be located along or above the terrace edge of the Rock Creek Class 1 stream segment in section 10. No harvest is proposed anywhere in this RMZ.

- Limit harvest equipment and hauling operations to periods when soils are relatively dry, (less than 20%), frozen or snow covered to minimize soil compaction and rutting, and maintain drainage features.

- On tractor harvest units the contractor and sale administrator would agree to a general skidding plan prior to equipment operations to limit trails to 15% or less of the harvest unit. Use of existing skid trails would be preferred, unless they are too steep. Ground skidding equipment would be limited to slopes less than 45%. Cable harvest should be implemented on all slopes over 45% to minimize disturbance and improve efficient removal of timber.

- On moderate to densely stocked stands, whole tree skidding can reduce slash hazard; however, it can also remove a portion of nutrients from growing sites. Target levels of fine slash and woody debris would be to retain 5-10 tons/acre well distributed on site while meeting the requirements of the slash law. On cable units leave a portion of tops. On thinning sites with lower basal area, large woody debris would be retained as feasible since it may not be possible to retain 5 tons/acre and the emphasis would be on providing additional coarse woody debris (CWD) in the future. Slash would be placed on main skid trails to protect soils, reduce erosion potential, and prevent potential unauthorized ATV use as needed.

- Existing roads would be maintained in association with the harvest activities. Road improvements would include surface blading, and installation of drainage features to prevent surface erosion and sediment delivery to streams as needed to comply with BMP'S, and to protect water quality.

- Road use would be limited to dry or frozen ground conditions to reduce rutting and erosion. New road construction, including drainage features should be completed in the summer or fall prior to freeze-up. During contract administration check, snow/frozen ground conditions prior to operations.

- All road maintenance and harvest equipment would be cleaned of plant parts, mud and weed seed to prevent the introduction of noxious weeds. Equipment would be subject to inspection by the Forest Officer prior to moving on site.

- All newly disturbed soils on road cuts and fills would be promptly reseeded to site adapted grasses to reduce weed encroachment and stabilize roads from erosion.

- Weed treatment measures would include roadside and spot herbicide treatment of noxious weeds. Where herbicide treatments are required by the Forest Officer, herbicide must be applied under the supervision of a licensed applicator following label directions in accordance with Department of Agriculture regulations, applicable laws and rules and regulations of the Mineral County Weed Board.

- DNRC would monitor the project roads and areas to evaluate weed control measures implemented and to determine if any new noxious weeds become established.

Soils Analysis Methods and Area

Methods for disclosing impacts include using general soil descriptions and management limitations and then qualitatively assess the risk of negative effects to soil productivity from compaction, displacement and erosion from each alternative.

The soils analysis included an evaluation of Lolo National Forest Land System Survey, and St Regis Soil Survey data, air photos, past harvest design and on-site field reviews by a DNRC hydrologist/soil scientist. For the purposes of this analysis, minor soils of 5% or less of the area were grouped based on slope, soil properties and interpretations. Field reviews were conducted to verify the soil properties and current conditions to assess past and predicted effects based on DNRC soil monitoring results on previous harvest operations. The soil analysis considered soil interpretations and the physical effects to soils from the area and degree of harvest disturbance associated with skidding and roads. The analysis for soil nutrients considers the area of disturbed surface and the fine litter and coarse woody debris available to supply organic materials and nutrients to the soil.

The analysis area for geology and soil resources includes the proposed harvest units and locations of existing roads and temporary road construction will provide access within state parcels of Sections 10 and 14, T14N, R25W.

Existing Conditions- Soils

The bedrock geology in the project area includes Pre-Cambrian age meta-sedimentary quartzites, argillites and limestones that are mainly well fractured. The proposed harvest areas are located on the alluvial terraces along Rock Creek and on the steep mountain sideslopes and ridges within the Rock Creek watershed. The mountain midslopes and sideslopes have soils forming in moderate to deep colluvial soils with gravelly subsoils on the ridgelines and convex slopes. Bedrock outcrops are common on steeper sideslopes and ridges, and generally rippable. Surface soils are shallow to moderately deep mixtures of fine gravelly colluvium and varied thickness of reddish volcanic ash influenced soils that tend to be deeper on the northerly aspects. Where the volcanic ash soils occur in over 4” depths, potential site growth and seedling establish is improved.

The valley bottom is formed of mixed alluvium and historic glacial Lake Missoula influenced deposits that are mainly deep and coarse textured gravels and sands. Segments of Rock Creek are deeply downcut through the alluvial terraces, resulting in abrupt breaks and minor areas of marginal slope stability. No especially unusual or unique geologic features occur in the project area. No areas of slope instability were noted within proposed harvest units or on proposed roads and there is low risk of effects to slope stability or geology.

Table S 1 Landtype / Soil Map Unit Descriptions			**Management Implications Risk Ratings of Low, Moderate, High**			
Map Unit	**Name**	**Soil & Vegetation Descriptions**	**Compact ion hazard**	**Displace-ment**	**Erosion**	Comments
13U-A 13U-B	Alluvial Terraces 0-45% slopes	Deep, well-drained soils, comprised of coarse gravelly sandy and cobbly loams. Some localized wet habitats may occur in swales.	Low to Mod	Mod	Low on flats. Mod to Hi on breaks	Unit A Is Drier conifer and timber productivity potential is low to moderate. Unit B Is Moist conifer and timber productivity potential is moderate. Terraces are well suited for tractor operations.

30 MC	Mountain Sideslopes from Limestones 20-40% slopes	Soils are deep and well drained. Consists of residual rock mixed with gravels and cobbles from limestones. Major habitat type is Douglas fir on south slopes and grand fir on north slopes and moist swales.	Low-Mod	Mod	Mod	Timber productivity potential is moderate. Well suited for tractor operations. Due to high amount of stone and boulders, roads are generally rough.
30Q-8C	Mountain Sideslopes 20-40% slopes	Soils are deep and well drained. Consists of residual rock mixed with gravels and cobbles. Major habitat type is Douglas fir on south slopes and grand fir on north slopes and moist swales, with volcanic ash surface soils.	Low-Mod	Mod	Mod	Timber productivity potential is moderate to high. Season of use is typically long. Droughty soils may be difficult to revegetate on cut- and fillslopes.
60QA 60QB	Fluvial Breaklands 60% slopes	Soils are shallow to mod. Deep over cobbly gravelly loams. Intermittant ash surface on QB sites. Excessively well drained & droughty. Vegetation is dry mixed conifers Ponderosa pine, Douglas-fir.	Low	High	High for bare soils	Sediment delivery is concern and will require management considerations such as cable logging and road construction may require ¾ or full bench construction.
60QC	Fluvial Breaklands > 60% slopes	Soils are similar to 60 QA & 60QB, Vegetation is higher productity on ash surface soils and moister sites than 60QA & QB and supports larch. Shallow rock or rock outcrops >20%	Low	High	High for bare soils	Sediment delivery is concern and will require management considerations such as cable logging and road construction may require ¾ or full bench construction.
61QC	Fluvial Breaklands Dissected > 60% slopes	Soils are similar to 60 Q excessively well drained, loamy skeletal soils from quartzite/argillite . Ash surface . Mixed conifer, moister in draws and supports larch . Shallow rock or rock outcrops >20%	Low	High	High for bare soils	Sediment delivery is concern and will require management considerations such as cable logging and road construction may require ¾ or full bench construction.
64QB	Steep Mountain Slopes > 60% Quartzite	Colluvial soils forming in quartzite/argillite, excessively well drained, loamy skeletal textured and shallow to moderately deep . Vegetation is dry mixed conifers.	Low	High	High for bare soils	Sediment delivery is concern and will require management considerations such as cable logging and road construction may require ¾ or full bench construction.

Summary Land Type Association properties are included in table S-1 (referenced form the soil surveys), and a map is included in the appendix. General interpretations for harvest operations: Slope steepness over 45% limits tractor operations due to potential for excessive disturbance and erosion. Cable operations on steeper slopes limit ground disturbance. North and easterly aspects have moderate to high productivity associated with typically deeper surface soils and moist sites. On steeper south and westerly aspects potential annual productivity is moderately low. Competition for moisture from understory vegetation and high insolation limits regeneration.

Balanced road cut/fills are practical up to 50% where slope steepness increases the quantity of material excavated. Hard rock at shallow depth occasionally limits excavation. Material exposed by road construction is subject to rock ravel on steep cutbanks and is difficult to revegetate. Sediment delivery is concern on the breakland landtypes and will require management considerations such as cable logging and road construction may require ¾ or full bench construction.

Effects of Past Management

There was previous harvest in Unit 5 of section 10 and the valley floor and eastern slopes of Section 12 parcel. Historic harvest effects have largely recovered with vegetation and trees established in secondary trails. A few major skid trails and landing sites are still apparent and harvest effects are estimated to be less than 5% of the proposed harvest units. Field assessment found that the previous soil effects have ameliorated in the stands proposed for harvest and the parcels are well regenerated to conifers. There are apparent growth reductions still on some of the old landing sites that would likely be used again.

Nutrient Cycling & Soil Productivity

There are moderate to high levels of existing downed course woody debris across the proposed harvest areas that is within the range of woody debris levels on representative vegetation types established by Graham et al. (1994). The tree mortality of lodgepole pine from insects has resulted in many trees shedding their needles, which helps return organic matter and nutrients to the soil. Retaining vegetative litter and woody debris helps to control erosion on disturbed sites and provide media for healthy soil fungi and conservation of soil nutrients important to tree growth. It is desirable to maintain old and new coarse woody debris (>3" dia.) at ~10-15 tons/acre on the harvest units.

Environmental Effects to Soils

Direct, Indirect and Cumulative Effects of the No Action Alternative on Soils

Implementation of the no-action alternative would result in no soil resource impacts in the project area. Minor areas of older skid trails and effects would continue to recover over time. Soil resource condition would remain similar to those described in the existing conditions sections of this environmental assessment.

Direct and Indirect Effects of the Action Alternative on Soils

Implementation of the action alternative is a combination of salvage harvest of dead, dying and high-risk trees and thinning to reduce competition and improve growth of diverse tree species.

Approximately 2.3 miles of new road would be constructed that would change the land use to transportation and disturb about 11.5 acres of land as noted in table S-2. Proposed roads cross shallow soils and fractured bedrock, and rock raveling is expected that would require periodic maintenance. No areas of slope instability were noted on the proposed roads or harvest units. The high rock/coarse fragment soils are excessively well drained and durable to road traffic with implementation of standard road drainage features. On existing roads, road maintenance and site specific road reconstruction requirements would be implemented to improve road drainage and control erosion. All new roads would be grass seeded with site adapted grass to speed revegetation and control erosion and weeds.

Table S2 – Detrimental Soil Disturbance for the Action Alternative

Area of Analysis	Total Area (Acres)	Disturbance Rate (%)	Affected Area (Acres)
Harvest Units (including landings)	24 acres Ground Based 122 Cable	Ground Based up to 15% Cable 8.8%	3.6 10.7
Roads *	11.5	100%	11.5

Approximately 24 acres would be treated by ground based timber harvest and about 122 acres would be cable harvested. Primary soil concerns are potential for excessive surface disturbance, erosion or soil compaction with harvest operations. To maintain soil productivity, and promote conifer regeneration, BMP's and the listed mitigation measures would be implemented to minimize the area and degree of soil effects associated with harvest operations. Implementation of BMP's and the recommended mitigation measures, has been shown to effectively limit detrimental soil impacts to less than 15% of the harvest units based on DNRC soil monitoring on comparable sites (DNRC 2006, 2011) and recent harvest on nearby sites.

Cable harvest operations have resulted in 4 to 8.8 % harvest area impacts. We expect that by protecting at least ~80% of a harvest area in non-detrimental soil impacts, soil properties important to soil productivity would be maintained, and the projected impacts are below that range. The estimates of existing impacts are approximately 5% and additional impacts from the proposed operations are expected to add up to 10% = 15% projected. Contract administration would monitor on-going operations to control soil disturbance to avoid excessive impacts and meet silvicultural goals to reduce competition. The improved tree spacing would improve growth of retained trees, due to reduced competition for soil nutrients and moisture. For all these reasons, there would be low to moderate risk of direct and indirect effects to geology or soil resources as a result of the proposed action.

Nutrient Cycling & Soil Productivity
The level of tree mortality of pine has already caused many needles and fine litter to fall to the forest floor. Most needles and fine foliage that have not already fallen would be expected to break off during logging operations. On all proposed harvest areas a portion of old and new course woody debris (CWD >3" dia.) at ~5-10 tons/acre and fine litter (similar to historic ranges) would be retained.

Cumulative Effects of the Action Alternative on Soils
Cumulative effects to soils can occur from repeated ground skidding entries into the harvest area and additional road construction depending on the impacted. Currently, there are moderate effects of road construction and minimal effects from the previous selective harvest and pole removal in the proposed harvest units, which occurred over 30 years ago. There are few old skid trails evident, and impacts are estimated to occupy less than 5% of the proposed units and areas of previous harvest are well vegetated and stable. Implementation of the Action Alternative should present a low risk of cumulative effects based on the implementation of BMP's, and mitigation measures that would minimize the area of detrimental soil impacts. Road drainage would be improved on existing roads throughout the area and new roads would impact only 11.5 acres or less than 2% of the project parcels.

Cumulatively over the rotation of the forest stands, the combination of fine litter and coarse woody debris would maintain surface organic matter that provides media for healthy soil fungi and conserves soil nutrients and moisture important to tree growth and long term productivity. Improved tree spacing will reduce competition for nutrients and soil moisture, enhance growth of retained trees, and promote regeneration of conifers as noted in the vegetation section.

Water Resources-Analysis Methods & Area

The primary concerns relating to water resources within the analysis area are the potential impacts to water quality from sediment sources on roads and forest sites that can deliver to stream channels as well as inside the channels. In order to address these issues the following parameters are analyzed for each alternative:

- ◊ Miles of new road construction and road improvements
- ◊ Existing Sources and Potential for sediment delivery to streams
- ◊ Potential for water yield increase impacts to stream channel stability

A watershed analysis and field survey was completed by a DNRC hydrologist for the proposed project to determine direct, indirect and cumulative effects to water quality. The water quality evaluation included a review of existing inventories for soils and water resources (NRIS 2012, DNRC 2008), and reference to previous DNRC projects, and comparisons of aerial photos combined with GIS analysis to estimate the area of past timber harvest and vegetative recovery. Several field reviews were completed for the proposed harvest units, access roads and associated streams and the observations, information and data were integrated into the watershed analysis and design of project mitigations.

Sediment delivery

The analysis areas for sediment delivery are limited to the harvest units and roads used for hauling and will focus on the streams described as affected watersheds. Refer to the hydrology map WS-1 for analysis areas that include the proposed harvest units and road haul routes. This includes in-channel and upland sources of sediment that could result from this project. In-channel areas include the stream channels adjacent to and directly downstream of harvest areas. Upland sources include harvest units and roads that may contribute sediment delivery as a result of this project.

Water Yield

The analysis for cumulative effects to water yield considers the area of harvest units and access roads within the project drainages described as the affected watersheds. A DNRC hydrologist completed a coarse filter qualitative assessment of watershed conditions and cumulative effects as outlined in the Forest Management Rules (ARM 36.11.423) and the commitments described in the HCP concerning cumulative watershed effects. Based on the coarse filter review and past logging in the area, a more detailed assessment of sediment sources and stream channel conditions was also completed. The potential for increases in surface runoff water yield and affects to stream channels will be discussed considering the distribution and timing of runoff.

The analysis areas for watershed cumulative effects include the Rock Creek watershed that wholly surrounds the DNRC project sections and the access roads to those sections. Past, current, and future planned activities within each analysis area have been taken into account for the cumulative effects analysis.

State trust land parcel areas dismissed from further analysis:

The State trust land parcel in Section 24 and the NE corner of Section 10 are dismissed from further analysis for this project based on the following. Section 24 T14N, R25W was included in the original project public scoping. Section 24 is within the Fish Creek drainage and a considerable portion of the Fish Creek drainage was burned in a 2003 wildfire. As mitigation for all resources, the proposed action in section 24 will be postponed, no effects would occur and this parcel is dismissed from further analysis.

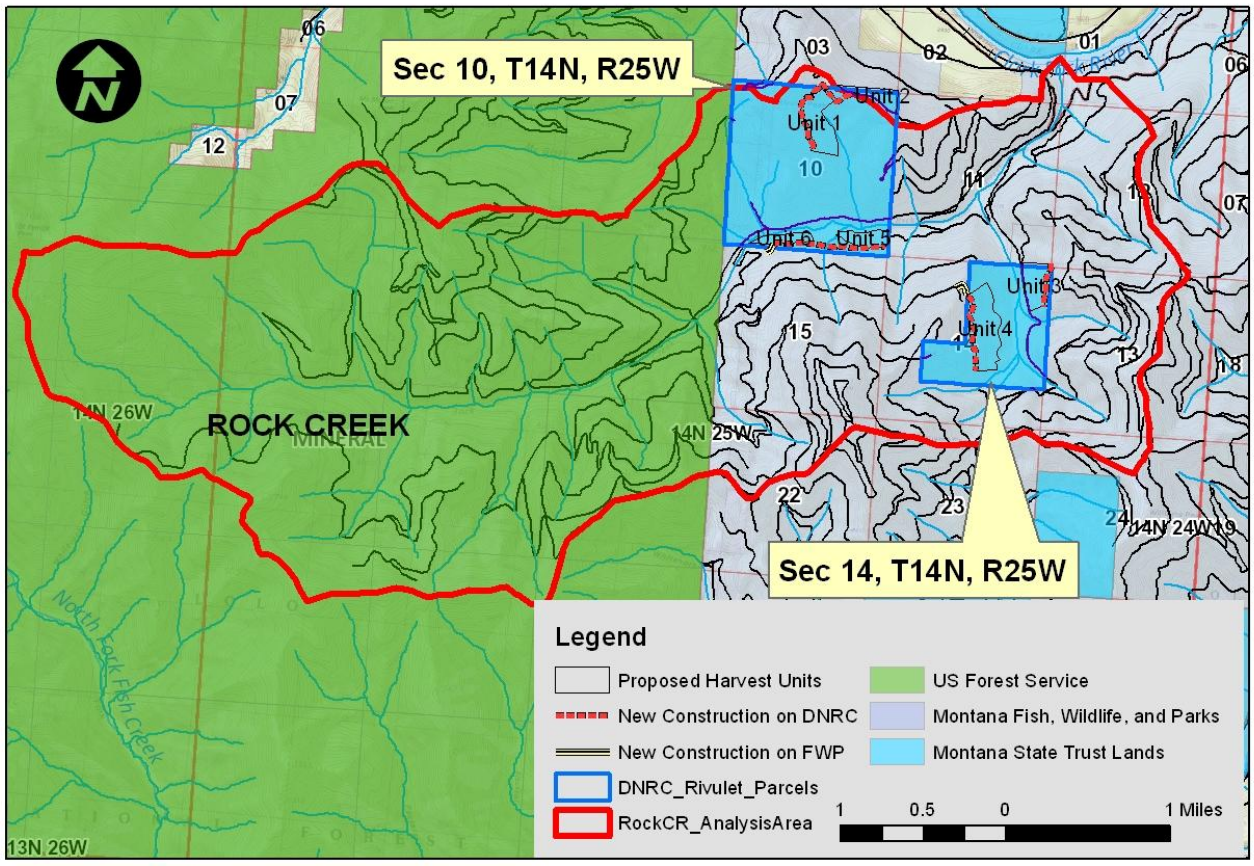
Minor harvest that includes cable salvage and thinning is proposed along a ridgeline in the NE ¼ of Section 10 T110N, R25W (refer to Water Resources map WS-1). Up to 15 acres of the proposed harvest is within a face drainage of the Clark Fork River. The proposed timber harvest and road use on the north side of the divide will be dismissed from further water resource and fisheries analysis based on the following site specifics. The proposed harvest is minor in area (20 acres) and is located over ½ mile from the Clark Fork River, where no disturbance would occur. This small harvest area would be cable skidded up to a stable landing area on the ridge, with minor soil disturbance of less than 10% of harvest area. No new roads are proposed on the face drainage of the Clark Fork River. There are no surface waters or drainage features in the proposed harvest area, or on the access road to this unit, and there is low potential for any direct, indirect or cumulative impacts to off-site runoff, sediment delivery or water quality from this small area.

Affected Watersheds

The project area is located mainly in the lower 1/3 of the Rock Creek drainage within 6th order (HUC 170102040603) about 1 mile South of Rivulet, Montana. The proposed Rivulet Timber Sale project is located on state trust land within parts of Section 10 & 14, T14N, R250W of Mineral County (refer to Rivulet Water Analysis Map). Rock Creek is a 3rd order perennial tributary to the Clark Fork River. Rock Creek drains a watershed area of approximately 8750 acres. The main stem stream channel of Rock Creek is a class 1 stream that flow across state section 10. Chicken Creek is a class 1 tributary of Rock Creek. Chicken Creek originates near Williams Pass and flows north through the state ownership in Section 14, T14N, R125W. The watershed analysis area also includes several wetlands and springs.

Average precipitation for the analysis area is 34in/year and ranges from a high of 60 in/yr in the headwaters near St. Patrick Peak (elevation 7128 ft) to a low of 18 in/yr near the mouth of Rock Creek (elevation 2900 ft.). By comparison, Rivulet Peak in the NW ¼ of section 10 is 4750 ft. and has a moderate average precipitation of 23in/yr. Within the project area of state sections 10 & 14, the average precipitation is moderate at 25 in/yr and elevation range is 3220 to 3600 ft. Precipitation occurs mainly as snow, and spring runoff is flashy due in part to considerable shallow rocky soils and steep gradients. The analysis area supports a mixed forest of lodgepole pine, Douglas-fir, ponderosa pine, western larch and spruce.

MAP WS-1 RIVULET PROJECT WATER ANALYSIS MAP
DNRC Parcels in Section 10 & 14 T14N, R25W



Rock Creek Ownership
The Lolo National Forest owns approximately 58% of the watershed, the State of Montana Trust Lands owns 10%, and State of Montana Fish Wildlife and Parks owns 32% of the watershed.

Regulations, Laws, Rules and Agreements that apply to Water and Fisheries Resources

Montana Surface Water Quality Regulations
The Rock Creek drainage is classified as B-1 in the Montana Surface Water Quality Standards (ARM 17.30.623). The water quality standards for protecting beneficial uses in B-1 classified watersheds are described in ARM 17.30.623. The B-1 classification is for multiple use waters suitable for; domestic use after conventional treatment, growth and propagation of cold-water fisheries, associated aquatic life and wildlife, agricultural, and industrial uses. Other criteria for B-1 waters include; no increases are allowed above naturally occurring concentrations of sediment, which will prove detrimental to fish or wildlife and a maximum 1 degree Fahrenheit increase above naturally occurring water temperature is allowed within the range of 32 to 66 degrees Fahrenheit.

Naturally occurring includes conditions or materials present from runoff or percolation on developed land, where all reasonable land, soil, and water conservation practices have been applied. Reasonable conservation practices include methods, measures, or practices that protect present and reasonably anticipated beneficial uses. The State has adopted Forestry Best Management Practices BMP's through its Non-point Source Management Plan as the principle means of controlling non-point source pollution from silvicultural activities. Stream temperatures are discussed in the fisheries section. DNRC provides further protection of water quality and sensitive fish through implementation of the Streamside Management Zone (SMZ) Laws and Forest Management Rules.

Water Quality Limited Waterbodies and Beneficial Uses
Rock Creek (HUC 170102040603) and its tributary Chicken Creek are not listed as impaired on the State's 303(d) list of impaired bodies of water (MTDEQ 2012). Beneficial Uses- Downstream beneficial uses in Rock Creek are mainly aquatic life. Rock Creek is not part of a municipal watershed. There are no water rights on the DNRC parcels proposed for harvest or immeadiatly downstream.

Montana Streamside Management Zone (SMZ) Law
All rules and regulations pertaining to the SMZ Law will be followed. An SMZ width of 100 feet is required on Class I and II streams when the slope is greater than 35%. As stated in SMZ (ARM 36.11.302(ii)), where the slope of the SMZ decreases to 15% or less to form a bench that is 50 to 100 ft. from the ordinary high water mark and at least 30 ft. wide, the SMZ boundary is located at the edge of the bench nearest the stream. An SMZ width of 50 feet is required when the slope is less than 35%.

DNRC Forest Management Rules and Habitat Conservation Plan
All applicable State Forest Land Management rules and regulations regarding watershed and fisheries management will be followed. This includes, but is not limited to rules listed for water quality (ARM 36.11.422), cumulative effects (36.11.423) Riparian Management Zones RMZ (ARM 36.11.425), Fisheries (ARM 36.11.427) and Conservation Strategies outlined in the DNRC Habitat Conservation Plan (HCP 2011). As part of ARM 36.11.427(3)(a)(i) and (iv) and ARM 36.11.436, DNRC is committed to designing forest management activities to protect and maintain bull trout, westslope cutthroat trout and all other sensitive fish and aquatic species as noted in the fisheries assessment. Rock Creek and its tributary Chicken Creek are Class 1 fish bearing streams. No actions are proposed in section 14 within 300 feet of Chicken Creek. Harvest is proposed on a terrace that is 94 feet from Rock Creek. The HCP requires a no-harvest zone within 50 feet of a Class 1 fisheries stream, and the proposed no-harvest zone within 94 feet of Rock Creek provides an area greater than necessary for effective protection of native fish habitats as determined in the HCP environmental analysis.

Existing Conditions- Water Resources and Water Quality

Past management activities in the project area include timber harvest, grazing, road construction, fire suppression and recreation. Streams in the project area were reviewed for channel stability and sediment sources. Rock Creek and its tributary, Chicken Creek are Class 1 perennial streams. Overall water quality in the Rock Creek and Chicken Creek drainages are considered good, based on sediment surveys and recent stream channel stability assessments. Lower Rock Creek is dewatered in late summer up to the State land section 10, due in part to the rocky nature of the drainage. Chicken Creek has perennial flow in the mainstem. Past management activities in the Rock Creek watershed include, timber harvest, mineral exploration, and road construction. The drainage is dominated by mixed conifer forests that were largely initiated by fires. Historic harvests were extensive in the lower drainage on corporate timberlands, and these areas have reestablished conifers. Some impacts may have occurred on adjacent corporate lands (acquired by MTFWP) associated with logging and road use practices in the prior to BMP adoption in the 1980's. There is no apparent recent harvest from aerial photos taken in 2011.

Sediments

The proposed haul route from Interstate 90, would utilize existing paved, graveled and native surface roads. The Rock Creek road parallels the stream in the rocky canyon of the first mile of Rock Creek and there are likely low levels of dispersed sediment from portions of the road and at crossings. Most of the road is located on higher alluvial terraces away from the stream. The road is regularly maintained and has a gravel base. Approximately 86 miles of road have been constructed in the Rock Creek drainage for timber management and land access, with higher density in the lower drainage. Based on GIS analysis the density of existing roads is about 6.3 miles of road per square mile of the watershed analysis area. By comparison the existing road density on the DNRC project parcels is 2 miles of road per square mile of the watershed analysis area. There are estimated 82 crossings of combined streams, and draws with ephemeral flow within the Rock Creek drainage. The proposed road haul routes mainly meet BMP's. There is dispersed sedimentation associated with the main Rock Creek road that is located near the stream in the lower 2 miles of the stream. Segments of roads have recently been reclaimed on the MT FWP lands and a previous stream crossing was removed and reclaimed in the west ½ of section 11, just downstream of the project area.

There are no existing stream crossings of Rock Creek in DNRC section 10. There is an existing bridge just upstream in section 15 that would be used for hauling. The bridge complies with all BMP's and is not a source of sediment. The SE ¼ of section 16 has an unnamed Class 3 stream segment that has spring runoff flows downslope from section 15. There is a short defined channel that goes subsurface on an alluvial terrace and this segment does not connect to Rock Creek.

Existing Water Yield

DNRC estimated water yield using the Equivalent Clear-cut Acres (ECA) method as outlined in Forest Hydrology part 2 (Haupt et al. 1976). There has been considerable harvest within the lower Rock Creek drainage, largely from 1960 to 1990 on corporate timberlands that have recently been acquired by Montana Fish Wildlife & Parks. Previously harvested sites have regenerated to conifers and recovered some water yield increases. ECA analysis estimates the water yield increase based on the amount of vegetative cover from natural disturbance such as fire and mortality or from timber harvest, roads or land clearing (refer to table WS-1). ECA is a function of precipitation, total area roaded and harvested, percent of crown cover removal in harvest areas, and the amount of vegetative recovery that has occurred in the harvest areas. Increases in water yield over total forested conditions can affect stream channel stability, yet a water yield of 10% to 12% (based on channel conditions) over natural conditions is unlikely to have a measurable effect on stream stability. For this project DNRC set a moderate threshold of 12% for cumulative effects to protect water quality, fisheries and beneficial uses.

Table WS-2 Estimated Existing Annual Water Yield Increase for Analysis Area

Rock Creek Analysis Area	Rock Creek Average PPT	Allowable % Water Yield Increase	Existing Water Yield Increase
8749 acres	AVG 28" / year	12%	8.63 %

Stream channel stability ratings were completed on the main stem of Rock Creek, using the USFS Stream Reach Inventory and Channel Stability Evaluation Procedure (Pfankuch, 1978). All reaches evaluated were rated as good in 2013.

Environmental Effects to Water Resources

Direct and Indirect Effects of the No Action Alternative on Water Resources

The effects of the No Action Alternative would be the same as previously described under existing conditions for water resources. Sediment from the main Rock Creek system roads may occur in flux depending on the levels of road maintenance. Water yields may increase naturally, but not substantially, as older lodgepole stands are attacked by beetles and die. However, those increases are expected to be low.

Direct and Indirect Effects of the Action Alternative on Water Quality & Resources

The primary risk to water quality is associated with roads and especially stream crossings or sites where sediment could be delivered to stream channels. The proposed action would use existing forest access roads and construct up to 2.35 miles of road, which is located well away from surface waters and presents low risk of sedimentation. New roads would have adequate road surface drainage installed and would be revegetated to control erosion. Road maintenance would be completed on existing haul roads to improve drainage and would be maintained concurrently with operations to reduce maintenance needs. One new stream crossing would be constructed on an intermittent tributary stream that does not connect to Rock Creek and there is low potential for off-site sediment delivery to surface waters.

Timber harvest equipment operations can directly impact water quality if off-site erosion occurs. Timber harvest units 1, 2, 3 and 4, are located over 200 feet from surface waters. Unit 5 (15 acres) and Unit 6 (9 acres) are relatively small units that are located on a level alluvial bench and footslopes above Rock Creek. Rock Creek would be protected from disturbance and sedimentation by designating a Streamside Management Zone (SMZ), and Riparian Management Zone (RMZ) on the portion of harvest boundaries adjacent to Rock Creek. An RMZ of 94 feet distance would be located based on stand potential tree height. No harvest would occur within the 94 foot RMZ of Rock Creek to maintain a buffer to disturbance and prevent sedimentation.

The protective boundaries would restrict equipment operations to ensure protection of vegetative buffers and prevent erosion or sediment delivery consistent with Forest Management Rules for protection of streams with sensitive fish species present.

DNRC would implement all applicable BMP's, Forest Management Rules and site-specific mitigation measures to control erosion and protect water quality. The proposed timber harvest and road maintenance is expected to result in low risk of direct or indirect water quality impacts from erosion and sediment delivery due to buffer distances and implementation of mitigation measures. For these reasons, there is low risk of impacts to water quality or downstream beneficial uses occurring as a result of the proposed action.

Cumulative Watershed Effects of No Action Alternative

Cumulative watershed effects are described as impacts on water quality and quantity that result from the interaction of past and current conditions and the proposed management actions. A cumulative watershed effects assessment included the combined past and current effects across all ownerships in the watershed analysis area. Timber harvest and associated activities can affect the timing, distribution and amount of water yield in a watershed. Low to moderate cumulative effects of timber harvest, agricultural use, grazing, roads and irrigation diversions have occurred in the project area drainages since the early 1900's. Based on aerial photos and site reviews, the more extensive timber harvests and road construction on adjacent ownership area occurred between 1960 to 2000. Past management activities in the proposed project areas include timber harvest, road construction, mining, fire suppression and recreation. Past, current, and future planned activities within each analysis area have been taken into account for the cumulative effects analysis. Under the No Action Alternative, cumulative effects would remain the same as described in existing conditions.

Cumulative Watershed Effects of Action Alternative

The proposed action would treat a total of 146 acres with harvest and thinning to reduce competition and improve growth of mixed conifers and remove dead, dying and high-risk lodgepole trees. The harvest would

range from group selection to patchy in distribution, reflective of the insect caused tree mortality. An overstory of mixed conifers including western larch, Douglas-fir, ponderosa pine, western white pine, and cedar and advanced regeneration would be retained. This level of harvest would create up to an additional 67 acres of equivalent clearcut area (ECA) within the Rock Creek analysis area as noted in the following table.

Table WS-2 Estimated Action Alternative Annual Water Yield Increases for Analysis Area

	Harvest Area PPT	% Allowable WYI	Existing Water Yield Increase	Treated Acres from Actions	New Road from Actions	ECA Increase from Actions	Post Percent Water Yield Increase	Net/Post-Project % Water Yield Increase
Rock Creek Analysis Area 8749 acres	AVG 28	12%	8.63 %	146	2.3 mi	67	8.72%	0.9 %

There is low risk of cumulative watershed impacts due to water yield and sediment yield increases occurring from this proposal due to the following reasons. The low level of harvest on DNRC lands as a portion of the drainage area, the project is located with relatively moderate levels of precipitation (average 25 to 27 inches/yr), and would not noticeably increase water yield by retaining approximately 50% of forest cover and removing dead trees with lost canopy interception and evapotranspiration. There is a moderate amount of existing ECA and predicted water yield increase in Rock Creek from the proposed action would be less than 1% of the water yield for this drainage. The combination of salvage and selective harvest is expected to accelerate growth and vigor of the retained trees. The existing and proposed levels of harvest are less than a 10% threshold and below the levels normally associated with detrimental increases in water yield, peak flow, or duration of peak flows, therefore, there is low risk of cumulative watershed effects from increased water yields that may affect flow regimes or channel conditions as a result of this project.

The proposed road construction would build 2.15 miles of new road on the state land parcels and 980 ft of connector road on MT FWP land. Construction of the new roads would increase road density from 6.3 miles/sq.mile to 6.5 miles/sq.mile in the Rock Creek drainage. Road density in the state lands project parcels would increase from 2 miles/sq.mile to 4.15 miles/sq.mile, which would be less than the basin average. No new stream crossings are proposed on perennial streams. The proposed new roads are located well away from streams and there is low risk of off-site sediment delivery to streams. Existing road drainage within the project parcels and haul routes would be improved to comply with BMP's, with an emphasis on sediment control at existing stream crossings, therefore, there is low risk of cumulative watershed effects from sedimentation as a result of this project.

Fishery Resources Analysis

Introduction

The following analysis will disclose anticipated effects to fisheries resources within the Rivulet project area. The fisheries issues and concerns related to sediment, request for no SMZ harvest, road density and cumulative effects are listed at the beginning of this report. Direct, indirect, and cumulative effects to fisheries resources of both the No-Action and Action alternatives will be analyzed.

Fisheries Analysis Methods and Area

The proposed timber harvest and road construction can impact fish habitat primarily by accelerating sediment delivery to adjacent stream channels. Analysis methods will consider fisheries populations as absent or present, effects to fish habitat by sediment and flow regimes as affected by water yield. The analysis methods for sediment delivery and flow regimes will follow those used in the Water Resources portion of this report. Expected effects to fisheries habitat will be addressed qualitatively using the current condition as a baseline and disclosing the expected changes due to the proposed alternatives.

Sediment Delivery
The analysis area for sediment delivery is limited to the harvest units and roads used for hauling within Rock Creek and the tributary drainage of Chicken Creek as described in the water quality and quantity section and noted on Watershed map WS-1. This includes in-channel and upland sources of sediment that could result from this project.

Cumulative Effects
The cumulative effects analysis area for sediment delivery is limited to the harvest units and roads used for hauling. The cumulative effects considers the extent of new roads as a proportion of total road density in the Rock Creek drainage and their potential impact to sediments and water quality that could have measurable or detectable impacts to those fish-bearing streams. The potential changes in water yield were analyzed in the water resources section for changes in flow regimes and channel forms.

Initial Concerns and State trust land parcels dismissed from further fisheries analysis:
No harvest is proposed near project streams within the riparian stand site potential tree height (@ 100 years age), which is the zone that generally provides shade to moderate stream temperatures and provides woody debris that contributes to complex habitat and channel stability. An analysis of this same riparian harvest prescription in the Environmental Impact Statement for the Forested State Trust Lands Habitat Conservation Plan indicates a low risk of impacts to woody debris and stream shading (and stream temperatures affected by direct solar radiation). No new road crossings are proposed that may affect habitat connectivity, and use of existing roads and bridges do not affect connectivity. Stream shading, stream temperature, large woody debris recruitment and stream connectivity are dismissed from further analysis, as impacts to these resources are not expected to occur.

The State trust land parcel in Section 24 and the NE corner of Section 10 (unit 2) are dismissed from further fisheries analysis for this project based on the very low risks of direct, in-direct or cumulative effects based as noted in the water resources section.

Existing Conditions- Fisheries

Montana Fish Wildlife and Parks noted that Rock Creek and its tributary Chicken Creek contain genetically pure westslope cutthroat trout populations with no other known fish species present. These populations have considerable conservation value for native fish and represent about a third of the secure pure populations in the Fish Creek area. No bull trout have been found in the drainage and the stream is not considered a node or core bull trout stream. Rock Creek is dewatered in the lower two miles of channel, typically from late July to mid winter, which interrupts connectivity to Fish Creek. Westslope cutthroat trout were noted near the bridge in SW ¼ of section 15. Rock Creek is deeply entrenched in an alluvial terrace through DNRC section 10 T14N, R15W. No previous harvest is apparent in this stream bottom. Stream channel stability was evaluated as good in 2013 on stream segments of Rock Creek and Chicken Creek through the DNRC parcels. Several draws in section 10, T14N, R25W are represented as streams on the topographic map, yet the draws are ephemeral in nature with a short period of flow during runoff (<1 month) and do not support fish. The stream segment on the south boundary of section 10 has slightly longer surface flows in the spring for a short segment, but goes subsurface in an alluvial fan and does not connect to Rock Creek, and does not support fish.

The haul roads were reviewed for sources of sedimentation and road drainage improvement needs. One source of road surface sediment was noted on the main Rock Creek county road crossing in the NE ¼ of section 11, T14N, R25W. No sources of direct sediment delivery were noted on the haul routes.

Environmental Effects to Fisheries

Fisheries Effects of the No-Action Alternative:
With no action, no road construction or timber harvest would occur. Some continued sedimentation from roads would occur depending on the levels of recreational road use and occasional road maintenance.

Fisheries Effects of the Action Alternative:
With implementation of the Action Alternative, 76 acres of timber harvest would occur within the Rock Creek drainage and is mainly low impact cable harvest. Approximately 24 acres of this is selective ground based harvest and would occur on units 5 & 6 Rock Creek within section 10. No other proposed harvest would occur near a class one fisheries stream. Rock Creek would be protected by designating a Streamside Management Zone (SMZ), and Riparian Management Zone (RMZ).The RMZ was designated at 94 ft to maintain a buffer to disturbance and prevent sedimentation by extending the RMZ width to stand potential tree heights and a terrace slope break. The flat terrace location of the unit boundaries provides a wider buffer to the stream than required for effective protection as determined in HCP analysis (DNRC 2010, Lakel 2010) and there is low potential for sediment delivery. Combined mitigation measures for harvest operations and season of use are all directed at minimizing soil disturbance to prevent erosion and sedimentation. All other harvest units are located over 200 ft. from streams (including Chicken Creek) and this is expected to have a low risk of low direct or indirect impacts to sediments and associated fish habitats.

With the proposed action, surface drainage on existing roads would be improved and maintained to meet BMP's and control erosion and reduce current sedimentation. The existing Rock Creek bridge crossing to access the south side of Rock Creek does not impact Rock Creek. No new roads would be constructed adjacent to or crossing fisheries streams. The proposed road construction would build 2.15 miles of new road on the state land parcels and 980 ft of connector road on MT FWP land. The proposed new roads are located well away from streams and there is low risk of off-site erosion or sediment delivery to streams. Most of the new proposed roads are over 1/4 mile from a tributary stream, with the exception of the new access road proposed in the south ½ of section 10 , which is located over 300 feet from Rock Creek.

The proposed timber harvest combined with use of existing roads and new road construction is expected to result in an overall low risk of erosion and sediment delivery to streams as disclosed in the water resources section.

Cumulative Effects to Fish Habitat of the No-Action Alternative
No timber harvest or road construction is associated with this alternative. Existing sediment sources from existing roads, and land uses would continue to contribute sediment to streams within the Rock Creek drainage depending on levels of road maintenance and where remedial actions are implemented or natural stabilization occurs.

Cumulative Effects to Fish Habitat of the Action Alternative
There would be an overall low risk of additional cumulative impacts to fisheries with the proposed timber harvest and road construction due to the following reasons;

Combined mitigation measures for harvest operations and season of use are all directed at minimizing soil disturbance to prevent erosion and sedimentation. No harvest would occur near within 200 feet of Chicken Creek with low potential for sediment delivery to the stream. No harvest would occur within 94 feet of Rock Creek with low potential for sediment delivery.

The predicted water yield increase in Rock Creek from the proposed action would be less than 1% of the water yield for this drainage and there is low risk of cumulative watershed effects from increased water yields that may affect flow regimes or channel conditions as a result of this project.

As detailed in the water resources section, existing road drainage within the project parcels and haul routes would be improved to comply with BMP's, with an emphasis on sediment control at existing stream crossings. The proposed new roads are located well away from streams and there is low risk of off-site sediment delivery to streams. Construction of the new roads would have a minor increase in road density from 6.3 miles/sq.mile to 6.5 miles/sq.mile in the Rock Creek drainage. Road density in the state lands project parcels would increase from 2 miles/sq.mile to 4.15 miles/sq.mile, however, the site-specific assessment of actual road conditions on the haul route, the planned BMP mitigations, and foreseeable impacts is expected to have a lower generalized effects and a higher level of accuracy than the assessment of roads miles per square mile. No new stream crossings are proposed on perennial streams.

Noxious Weeds- Existing Conditions

Existing noxious weed infestations (mainly spotted knapweed) occur along portions of the existing access road system and within the section and on adjacent lands. Noxious weeds are spotty off roads in moist forest sites with more competitive native vegetation, yet are more common on dry southerly aspects. MT FWP completed recent weed control along roads following the acquisition of park lands in the Rock Creek drainage.

Effects of No-Action on Noxious Weeds
With no action, noxious weeds (mainly spotted knapweed) will continue to spread along roads and increase on the drier site habitats on all ownerships, dependent on weed control efforts.

Effects of Action on Noxious Weeds
Implementation of the Action Alternative would involve ground-disturbing activities that have the potential to introduce or spread noxious weeds in susceptible habitat types. An Integrated Weed Management (IWM) approach was considered for the Action Alternative that includes: prevention, revegetation and weed control measures for spot outbreaks are considered the most effective weed management treatments. Noxious weed density and occurrence would be similar to or may result in a potential slight increase due to soil disturbance and decreased tree canopy. Control efforts would promote revegetation and emphasize treatment of any new noxious weeds. More weed control would occur compared to the No Action Alternative.

Herbicide application would be completed to contain spotted knapweed and minor weeds along segments of spot infested roads as noted in mitigations. Herbicide would be applied according to labeled directions, laws and rules, and would be applied with adequate buffers to prevent potential herbicide runoff to surface waters. Implementation of IWM measures listed in the mitigations would reduce existing weeds, and is expected to limit the possible spread of weeds, and improve current conditions, to promote existing competitive and stable vegetation.

References
Graham, Russell T.; Harvey, Alan, Jurgensen, Martin; Jain,T.; 1994. Managing Coarse Woody Debris in Forests of the Rocky Mountains. Res. Paper INT-RP-477. Ogden, Utah: U.S.D.A., F.S., Intermountain Research Station, 12p.

Haupt, H.F., et al., 1974. Forest Hydrology Part II Hydrologic Effects of Vegetation Manipulation. USDA Forest Service, Region 1. Missoula, Montana.

Lakel, W.A., W.M. Aust, C. Bolding, C.A. Dollloff, P. Keyser, R. Feldt 2010. Sediment Trapping by Streamside Management Zones of Various Widths after Forest Harvest and Site Preparation. Forest Science 56(6) 541-551.

MT DNRC. 2003 Montana Administrative Rules for Forest Management on DNRC Forested Lands. Montana DNRC. Trust Lands Management Division. Helena, MT.

MT DNRC 2006, Collins, Jeffry, Compiled Soil Monitoring Report on Timber Harvest Projects 1988-2004., Montana Department of Natural Resources and Conservation, Trust Land Management Division, Forest Management Bureau, Missoula, MT.

MT DNRC. 1988-2012. Multiple Reports, Montana forestry best management practices monitoring: Multiple forestry BMP audit reports completed every 2 years,DNRC Forestry Division, Missoula, Montana.

MT DNRC. 2010. DNRC Habitat Conservation Plan, Final EIS Forest Management Bureau Division, Missoula, Montana.

MT DNRC 2011, Schmalenberg, Jeff, Compiled Soil Monitoring Report on Timber Harvest Projects 2007-2011., Montana Department of Natural Resources and Conservation, Trust Land Management Division, Forest Management Bureau, Missoula, MT.

MTDEQ (Montana Department of Environmental Quality). 2012. Montana 2012 303(d) Reports and assessments. Helena, MT. “Clean Water Act Information Center”, Reference 2013 websearch http://cwaic.mt.gov.

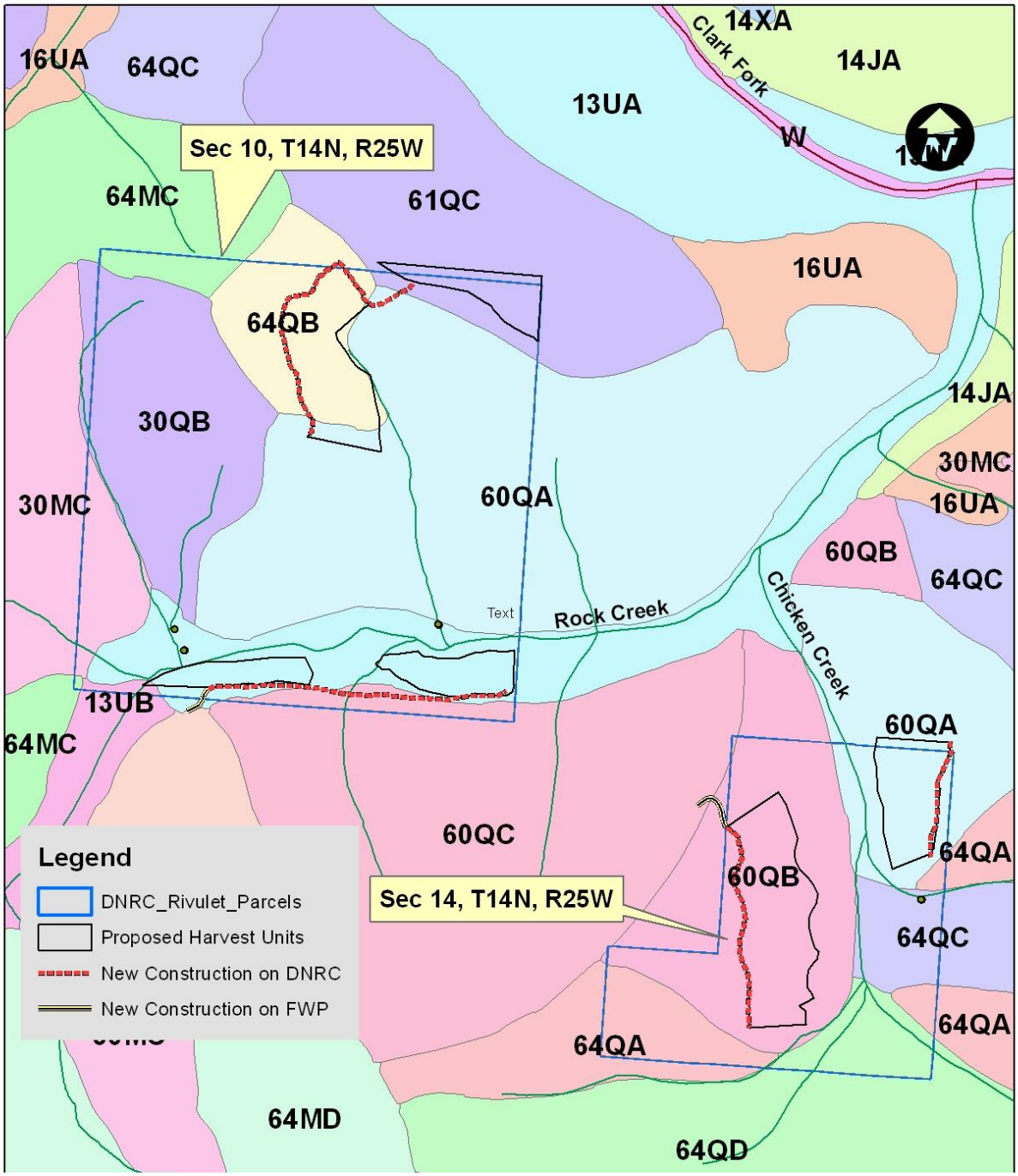
NRIS, Montana Natural Resources Information System 2013., Internet database search for water, water rights, soils, http://nris.state.mt.us/interactive.html

NRIS, Montana Natural Resources Information System, Internet database search for water, water rights, soils, and fisheries, 2012. http://nris.state.mt.us/interactive.html

Pfankuch, D. 1978. Stream Reach Inventory and Channel Stability Evaluation - A Watershed Management Procedure. U.S. Department of Agriculture - Forest Service, Missoula, MT. 26 pp.

Appendix A: Land Type and Soil Map

APPENDIX MAP S-1 RIVULET PEAK LANDTYPE/SOIL MAP
DNRC Parcels in Section 10 & 14 T14N, R25W



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